The Welding Engineer

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Founded by L. B. Mackenzie, 1916

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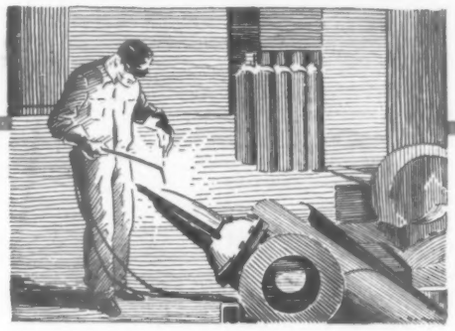

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Business as Usual

TEN per cent unemployment does not stop the wheels of industry. It is an undesirable but not a discouraging situation. The other ninety per cent continue to build homes and to feed and clothe themselves and their families. Perhaps a bit more sales effort would induce them to order more than their production, so others could go to work. It is the continued drive for sales maintained by the business leaders which keeps unemployment from getting worse. They are carrying on as they planned to carry on a year ago. Their sales plans and their advertising plans are based upon the orders they intend to get. The firms which show signs of "business as usual," regardless of "conditions," are the ones which will be responsible for turning the tide toward a demand for more production. They will be the first to profit by the next wave of prosperity.

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Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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EVERYBODY'S BUSINESS

BY FLOYD W. PARSONS

RIGHT now we need three things—a good memory of past events, a fair measure of common sense, and a large amount of pluck. We must remember that our captains of industry have proved themselves wholly unable to call either the top of a boom or the bottom of a depression. They showed a surprising willingness to accept the economic fallacies of last year, and today, are failing to exhibit that brand of courage which kindles hope and sweeps obstacles aside. The time to be afraid was more than a year ago when the preachers of caution were derided and reckless speculation was evident on every side.

New Aims and Viewpoints

My interviews with the leaders of American business in the fall of 1921 made up a picture that was inky blue. The same men who a year before had ridiculed the idea of a drastic slump in trade had become convinced that the era of hard times which had developed was only in its infancy.

In 1921 when the public mind was saturated with pessimism and despondency had brought the same kind of paralysis of effort that exists today, that was the most favorable moment to invest in securities and material that was offered the public in more than a decade. At that very instant the statements of economists were dismal. Capital and labor were refusing to cooperate. The outlook in Europe was gloomy. From everywhere came reports showing unrest, dissatisfaction, unemployment and lack of trade. Food supplies were low, and most of the foreign countries needed large quantities of practically all of life's necessities, but lacked the money to pay for them.

Such was the true picture of business throughout the world in the latter part of 1921. With the future seemingly hopeless, commodity prices, bond prices and the stock market all turned upward, and with the exception of a few months of bad business in the middle of 1924 and a short-lived slump in trade near the end of 1927, industrial conditions in America were generally satisfactory until the fall of last year.

History will again repeat itself. Human nature has not been altered. The bargains that appear in times of depression will be picked up by the people who have nerve, faith, patience and memories good enough to recall past experiences.

Wise business men will soon stop waiting for the "other fellow" to do something, and the immediate result will be the manifestation of a new buying spirit. Confidence will revive, and it will be disclosed that our wants and desires have changed but little. Attention will be directed toward producing what people want, rather than turning out what can be manufactured most easily.

Economy has been substituted for extravagance. Corporations have trimmed sails and most of them are strong in cash. Individual efficiency has increased, habitual loafers have been relegated to the sidelines and inventories are at a minimum. The stock market, while still being kicked up and down by professional gamblers, has been liquidated.

The bad news is out. Unfavorable factors have been proclaimed from the housetops. A few people will soon start moving, and supported by the forces of necessity, they will awaken the masses and the business stagnation will end.

Companies that expanded too rapidly have had a year of reorganization. Unprofitable units have been eliminated, waste reduced, costly inventories converted into cash, and the entire machinery of production and distribution adjusted to a program made up of current realities rather than idle hopes and imaginative plans.

What we seem to forget is that bad news is always with us and can quickly be found when we go looking for it. Calamity generally follows dire forebodings, while a healthy optimism is nearly always the forerunner of prosperity. If the coming years hold promise and hope for civilization, it is especially desirable to forecast that fact, for it is true that the things we most foretell soonest come to pass.

Before the fact has become apparent to us, we will have entered a new era of revived confidence and restored business progress. The scientific marvels of the new period, as usual, will surpass those of all previous times of industrial expansion. New methods, new machines and new materials will change the whole complexion of a hundred existing industries.

Our modern civilization will be built more than ever on laboratory findings. Science and the arts will open new roads. We will revise the air we breathe and the water we drink. Veritable palaces will cruise the seven seas. With the aid of synthetic methods, man will outdo Nature. The radio combined with television will develop a new culture. New ideas will sweep all of the important fields of human activity.

The present sad plight of the farmer will be tremendously relieved. Radio development has put an end to the isolation of the farmer, and the application of engineering to agriculture will rapidly make the production of foodstuffs a profitable business.

The output of the average agricultural worker has increased approximately 50% in the past 30 years, and the outlook is for an even more rapid increase in individual efficiency in the decade just commencing.

This presents us with the serious problem of diverting hundreds of thousands of farm workers into other lines of activity, but we would be confronted by a ten times greater difficulty if American agriculture had failed to match closely the productive feats of our factories and railroads. Electric power with the aid of chemistry is succeeding in developing a technical equality between agriculture and manufacturing, a development that is vital to a soundly-established prosperity.

Private flying will be inaugurated on a large scale and business will be speeded up. Thousands of planes and airships will be traveling back and forth across America within five years. Rapid transportation of one kind or another will not only extend sales territories, but will enable retailers to order goods every few weeks instead of purchasing large quantities two or three times a year.

It is true that science and engineering may largely be blamed for having upset life and industry. Current unemployment is due in large measure to the substitution of machines for hand labor. But if we will show the good sense of recognizing the present urgent necessity for changing our viewpoint and adopting new aims, most of the serious troubles that surround us will quickly disappear.

Instead of continuing to expand old industries, we must give earnest attention to the creation of new forms of enterprise. We come now to the essential jobs of adjusting production to consumption and diverting capital to the development of infant industries. In the words of one, we must now substitute a psychology of adjustment for a psychology of expansion.

The Victor Safety Regulator is now available in the "Senior" size and the "Junior" size; both double or single gauge and for all cylinder gases or pipe line distributing systems.

The "Senior" and the "Junior" Victor Safety Regulators are identical in basic design, excellence of workmanship and raw materials.

The Victor Safety Regulators are built to the accuracy of a fine watch; and of sturdiness to assure years of hardest usage.

VICTOR WELDING EQUIPMENT CO.

844 FOLSOM ST., SAN FRANCISCO

EDITORIAL

The A. W. S. Fall Meeting

PERHAPS the most gratifying aspect of the recent annual fall meeting of the American Welding Society is the evident fact during these activities that the effectiveness of the organization is very far from having reached its peak. The record-breaking registration at the technical sessions, the keen interest aroused by advance distribution of the programs, and the spirited discussions of the papers presented, indicate that the society is attracting attention of a sort which can with a little effort be crystallized into valuable cooperation. The fact that busy men came long distances for the purpose of listening to or participating in the discussions of specific subjects can be due only to a growing consciousness of the importance of these subjects. Many of those who came as guests will undoubtedly continue their contact with the work of the society by becoming members, and others will be attracted to membership through reading some of the convention papers which will be published. There are still more to be reached through the publication and distribution of the new codes and standards which are nearing completion. Furthermore, the display of welding equipment and materials in connection with the fall meeting furnishes an additional check on the increased interest in the important phases of welding operations. The booths demonstrating welding processes were literally forced into action with the first opening of the doors and were kept continuously busy in spite of most uncomfortable weather conditions. This interest was not obtained by any spectacular publicity, but by direct appeals to common sense. Men were there not merely to see, but to learn, and with a full appreciation of the value of learning. If men in industry are to continue in this mood of learning more and exchanging more information, the American Welding Society is just getting well started. Its membership should continue to increase steadily for many years to come.

The Business Outlook

ONE prominent merchandiser was recently quoted as warning sales managers not to be too generous with their encouragement of salesmen, not to let them think that half the work was already done for them. Such encouragement is often given for the purpose of robbing the sales force of its lack-of-cooperation alibi. Undoubtedly the current shrinkage in sales volumes is due in some measure to the expectancy that business would pick up in the fall. Business will certainly not pick up to any great degree, either in the fall, winter, spring or summer as long as business organizations are marking time to wait for the next boom. Why not face the facts? We are not selling enough. Let's sell more, right now, before business begins to pick up. Men who sell welding products can do it by developing new uses for the welding processes. Men who make welded products can do it by using welding on a larger scale to make further improvements and further manufacturing economies. These things are being done on a large scale, with the result that business is really good in the welding industry. The eggs are not all in one basket, for the welding processes have entirely new fields of application which promise to exceed many of the old ones as far as sales volume is concerned. In fact, the use of welding is creating new markets for many things which are simply of incidental use in connection with welding operations. For example, many tractors are being sold because new methods of making steel pipe stimulated the construction of long natural gas lines. There is also new business from the same source for manufacturers of excavating equipment, etc. As long as even a few industrial organizations continue to employ research departments for the development of new manufacturing ideas, the general business outlook will continue to be good. In individual cases there is always a need, however, for someone to keep himself posted on what is going on in industry and commerce, and to interpret each new development in terms of new sales opportunities. Such men don't let business fall down—and they don't have to wait for it to pick itself up.

Five Million on This Roll Call

THE greatest roll call that has ever been conducted, to enroll five million members in the American Red Cross in this country, will be opened November 11, Armistice Day, to continue until Thanksgiving Day.

In Chicago the Red Cross will seek 225,000 members. Campaigns for these will be conducted in schools, offices, churches, theatres, banks and business by volunteer workers.

The Red Cross needs the money these memberships will bring in to continue its tremendous work during 1931. The organization, which is a semi-official government service, is headed by the President of the United States of America.

During the year ending June 30, the Red Cross nationally expended $1,182,350.08 for service and disabled ex-service men and their families. The need for veteran relief is increasing, instead of decreasing, and the climax is still thought to be many years away.

The national organization handled 13,217 claims. Furthermore, $1,341,620.65 was needed to take care of 95,000 sufferers in 108 major disasters during the past year. More than $650,000 of this was in excess of contributions received for disaster relief.

Fifty-one thousand and forty-seven Red Cross nurses were enrolled to meet national and international emergencies. Seventy-four thousand four hundred and thirty-seven people were trained and certified in first aid work, and 52,798 were certified in life saving. Besides this, 37,626 people were trained and certified in home hygiene and care of the sick. Nearly 7,000,000 school children were enrolled in the Junior Red Cross during the past year, as well.

Non-Destructive Tests

NOW that so much is being done to perfect several different types of non-destructive tests and make their uses and limitations more generally understood, it is interesting to recall what a demand for them existed only a few years ago. There were many who stood pat on the theory that the use of welding would never be safe until non-destructive tests were available. The tendency today is to assume that welding is safe wherever the procedure is under proper supervision, and all the important factors in good welding are accounted for. Testing is recognized as only one factor in the successful welding program, and non-destructive testing appears in the more important role of a check on quality of workmanship for the economic purpose of reducing the cost of failures, rather than as a means of demonstrating the dependability of the welded product. Even if the insurance companies and inspecting departments should decide that they would no longer call for tests, the testing program would still be vitally necessary, for there is always the customer to be considered.

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Manufacturers of

Welding Rod ◆ Alloy Steels ◆ Equipment

WHITTIER, CALIFORNIA

Magnetographic Inspection of Welds

Improved Methods and Apparatus for Making and Recording Magnetographs, and Interpretation of Results of Tests

By T. R. Watts*

ABSTRACT.

THIS paper is primarily intended as a discussion following an article in The Welding Engineer of February, 1930, entitled "Magnetic Testing of Welds." The method consists of passing a magnetic flux through the weld (the lines of flux perpendicular to the welded seam), and obtaining a picture of the leakage-flux over the weld by means of iron filings. The variations developed at the Westinghouse Research Laboratories include electromagnets having flexible laminated cores, means of magnetizing rings and cylinders by winding with welding cable, use of iron powder reduced by hydrogen instead of filings, and convenient means of making photographic reproductions of the tests. Magnetographs of good welds and poor ones having various specified faults are shown for comparison, together with tensile-test data on the specimens. Merits and shortcomings of the method are discussed.

—Author.

THE February, 1930, issue of *The Welding Engineer* presented an excellent description of the magnetic method of weld testing developed by M. Roux which is described as the "magnetic spectrum" or "magnetographic" method. It consists of passing magnetic flux through the weld, and forming a picture of the leakage flux by sifting iron filings on a piece of paper placed on the weld. This method has been employed in the research laboratories of the Westinghouse Electric & Manufacturing Co. for considerably more than a year, in connection with studies of welding and weld-testing methods, and some improvements have been developed.

Electromagnet Features

In order to minimize the air gap between the electromagnet poles and the welded piece being tested, our magnet cores are now constructed of silicon steel electrical sheets, bent into a semi-circular shape as shown in Fig. 1. The core is constructed by bending strips of the sheet steel around a circular metal form, holding them tightly by making about every thirtieth strip long enough to reach clear around the form, and pulling the ends of the long strip together with bolts. After the core is thus built up to the desired thickness it is thoroughly annealed while still on the form, then drilled at the middle of the strips for bolts, and finally sawed or milled off to form the pole ends. In cutting off, allowance must be made for the strips opening out somewhat. The laminations are bolted together only at the middle of their length, thus leaving the ends somewhat flexible and loose. If they tend to spread too much they can be held together by means of strong rubber bands, or by taping loosely. By virtue of this construction, when the magnet is used the pole ends mash down and conform snugly to the surface of the plate under test, even if it is not straight and flat.

Fig. 1. Method of Making and Recording Magnetographs.
(An electromagnet having a laminated, flexible core is applied to the under side of the weld, and the magnetograph is formed on blueprint or Van Dyke paper and printed by means of a small, portable therapeutic arc-lamp. A larger magnet than the one shown is needed to obtain good results on this large ring.)

The magnet coils can be made in an infinite variety of ways, the only requirement being to supply sufficient ampere-turns, and even in that respect a wide latitude is permissible. Our magnets have from 5,000 to 10,000 ampere-turns, and are regulated by means of a rheostat when necessary.

The magnets described by M. Roux have relatively few turns and use a very heavy current. Our coils have several thousand turns of small wire, and take a current usually less than one ampere. For convenience, we have utilized field coils of direct-current motors, which are wound for about 55 volts per coil. Two or four coils are used on each magnet. They can be connected in parallel and supplied from an ordinary arc-welding generator, or connected with two coils in series for the common 110- to 125-volt d.c. mains, or with four coils in series for 220- to 250-volt d.c. supply.

Fig. 2. Split Coil for Magnetizing Welded Structures Which Form a Closed Magnetic Circuit.

Because of the small current drawn, an ordinary No. 18 wire "lamp cord" is adequate to carry current to the magnet; therefore the magnet can be used conveniently at considerable distances from the source of supply.

Control Switch on Magnet Itself

As explained later, the magnet is preferably used on the under side of a welded member. While it is energized a man cannot pull it off; therefore it is desirable to have a switch on the magnet, arranged so that a man can operate the switch with one finger while he supports the weight of the magnet, poles upward, in putting it on or taking it off the piece being tested.

When the switch is opened very quickly (as most switches

*Westinghouse Electric & Manufacturing Co. Research Laboratories.

automatically do), the collapse of the magnetic field builds up a high voltage in the magnet coils momentarily. For this reason, coils wound with enameled wire—or better, with enameled cotton-covered wire—are safest against breakdown of the insulation in the coils. However, the high voltage can be prevented by using a switch which can be opened slowly, thus dissipating the discharge energy of the magnet in the arcs at the switch points. Another remedy—probably the best one—is to connect a resistor of about 500 to 1,000 ohms across the magnet terminals permanently; or else use a generator field switch, thus automatically connecting the resistor an instant before the magnet is turned off. Then the resistor will dissipate the energy of the field discharge and hold the voltage down. However, it should be stated that occasional

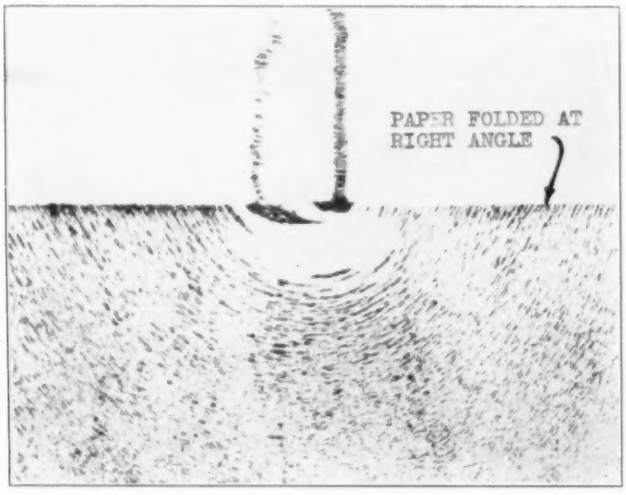


Fig. 3. Three-Dimensional Magnetograph Made on Vertical Welded Seam Having Very Poor Fusion.

(The upper part of the sheet was against the vertical plate; while the lower part extended horizontally, perpendicular to the welded-plate surface.)

neglect of these precautions has not yet ruined any of our magnets; and although the precautions seem advisable, they do not appear to be absolutely necessary.

We find it more convenient to stick the magnet on the under side of the plate being tested, whenever possible (or to set the plate on the upturned poles of the magnet), so that the magnet will be out of the way of the paper and iron filings, which are placed on top in the manner usually described in previous publications. If the plate being tested is not too thick for the size of magnet used, the test works just as well as if the magnet, paper, and iron filings were all on the same side; and by our method the filings cannot get to the magnet and stick all over it. Also, with the magnet underneath, it is easier to distribute the iron powder or filings uniformly over the paper on top of the weld, and to make a permanent record of the test in the manner described later.

Magnetizing by Winding with Welding Cable

Where an electric arc-welding machine is available, and the welded structure is in the form of a ring or cylinder, or forms a complete magnetic circuit, the magnetic test can be made without an electro-magnet. Several turns of flexible welding cable can be wound on the steel structure itself, and connected to the arc-welding terminals of the generator. The full ampere capacity of the welding generator can be passed through the cable long enough to get a test, so that relatively few turns of cable are required. For example, 300 amperes in 40 turns equals 12,000 ampere-turns—ample to test a welded ring of fairly large diameter. This method is most useful for pieces of large sectional area that are too big for testing with an electromagnet of manageable size; also for pieces having more than one welded seam.

If a considerable amount of testing is to be done by this method on pieces of similar size, it may be worth while to build some "split coils" so that several turns can be applied at once, and the ends of the turns joined by means of plugs and receptacles lined up in terminal boards. This idea is illustrated by Fig. 2, which shows a coil of thirty turns of 200,000 circular-mil extra-flexible cable, rated at 300 amperes. Much higher currents can be used for the short time required to make a test. The thirty-one plugs and receptacles are pulled together and pushed apart by means of hand-screws in the ends of the terminal boards. In fairness we must say that this device was somewhat disappointing, being so cumbersome that two men are required to handle it. Smaller, lighter units would be more desirable.

A more flexible arrangement is to provide welding cable in lengths of about 40 to 50 ft., each length wound on a small reel so that the cable can be easily wound on the piece to be tested. The ends of each length are provided with Westinghouse knuckle-joint connectors of the segment-pin type (Style No. 418128), so that any cable end can be easily connected to any other cable end, without bothering about pairs, or male and female connectors. Before connecting on another length, about a foot of rubber garden hose is slipped on the cable end, and after the connectors are joined the piece of hose is pulled over them to insulate them, thus avoiding the necessity of taping the connection.

Principally because it was available in the laboratory and easy to purchase, we have been using a very fine iron powder, reduced by hydrogen. It is very easy to distribute uniformly over a sheet of paper, by sifting it out of a sort of "pepper shaker" having very small holes in the cap. This iron powder is quite satisfactory, but we are not in a position to say that it excels the conventional iron filings.

Permanent Records on Photographic Paper

A very simple and satisfactory method of preserving a magnetograph is to use blueprint or Van Dyke paper on the weld, and expose it by means of a small portable arc-light, when the iron powder is properly arranged. Before exposing the paper to the arc-light, it is better to turn off the electromagnet, thus allowing the iron particles to fall down flat

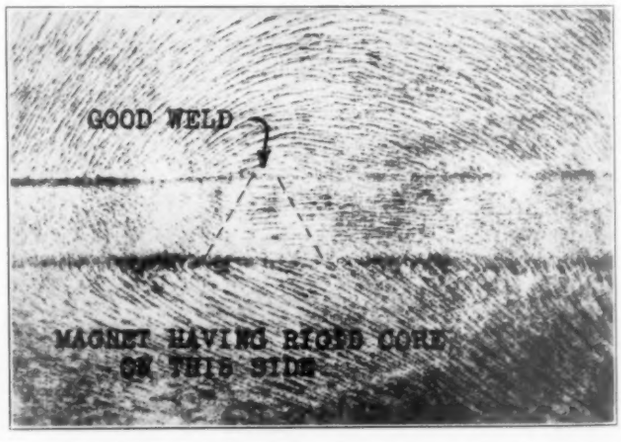


Fig. 4. Third-Dimension Magnetograph Made on Edge of Good Weld Specimen C2.

(A magnet with a rigid core was used and the specimen was crooked, making a larger air gap at the right end and resulting in a distortion of the leakage flux.)

against the paper. Otherwise, if the flux is strong the iron particles tend to form in strings which stand on end, parallel to the lines of leakage flux arching over the weld; and as the arc-lamp is moved around in making the print, these strings standing up from the surface of the paper do not print well. When the magnet cannot be turned off while making the print, the arc-light should be held in the same position throughout the exposure.

Strips of brass or other non-magnetic material should be laid on the ends of the printing paper to prevent curling while printing. The white stripes they leave on the print are convenient blanks in which to write data.

If a single print is sufficient and a negative impression is satisfactory, ordinary blueprint paper gives good results. By means of the simple arc-lamp described below, the exposure requires about 30 seconds, with the arcs approximately 10 in. from the paper.

A much better method, permitting numerous copies, is to use thin Van Dyke paper on the weld, then use the Van Dyke negative thus obtained, just as you would use an ordinary photograph negative, to make prints on photographic developing-out paper or on blueprint paper. A "contrasty" or "outline special" paper, such as Azo No. 4 or 5, gives best results and requires only about five seconds or less exposure in a photographic printing machine to make a positive print from a Van Dyke negative. The photographic paper print shows a surprising amount of detail, scarcely visible in the brown negative.

The Van Dyke negative made on the weld requires about one to two minutes exposure at about 10 in. from the arc-light.

Both blueprint and Van Dyke papers are sufficiently "slow"

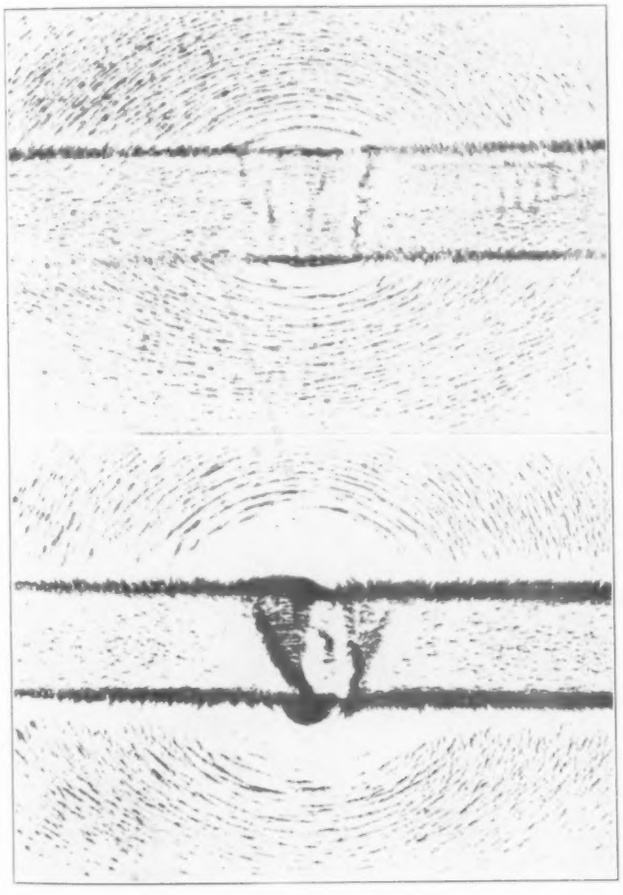


Fig. 5. Third-Dimension Magnetographs Made under Identical Conditions.

(Top: Fairly good weld. Bottom: Bad weld, with poor fusion and being partly cracked at the bottom of the V. An electromagnet having a flexible laminated core was applied on this side of both pieces.)

or insensitive that indoor illumination, even near a window, will not expose them perceptibly in the few minutes required to form the magnetograph. Both can be finished satisfactorily by simply washing thoroughly in water.

Arc-Lamp Used for Making Magnetograph Negatives

The arc-lamp we use for making the magnetograph negatives on blueprint or Van Dyke paper is a rather crude, home-made sort of device, but has been very satisfactory for the purpose. It is shown in Fig. 1, in position to print a magnetograph.

It consists of "twin arcs," using ¼-in. therapeutic-arc carbons rich in ultra-violet radiation, such as the Eveready Super-Tan (or C) carbons, or the Stackpole therapeutic-arc carbons. Any other carbons make longer exposures necessary.

The lamp is operated in series with a resistor (or reactor) of about 5 to 5.5 ohms, 10 amperes capacity, on the ordinary 110- to 120-volt a.c. or d.c. service. As constructed, it works better on a.c.

The two upper carbons are connected together electrically, and mounted in stiff hinges so that their ends can be tilted

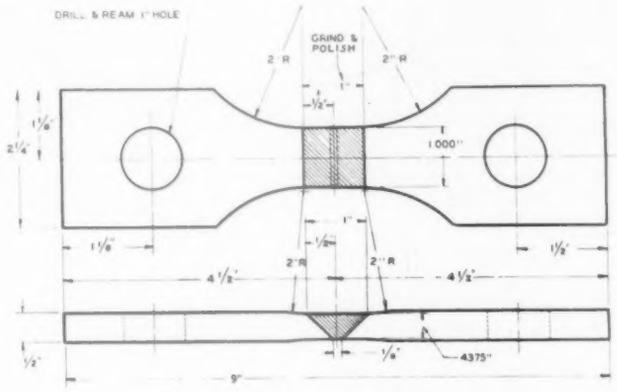


Fig. 6. Welded Tensile-Test Piece.

against the ends of the lower carbons for starting the arc. Each lower carbon is connected to one of the binding posts.

The carbons are held in metal tubes, preferably monel metal, which are about 1½ in. long, slotted and contracted at one end to make a friction chuck which provides both mechanical support and electrical contact for the carbons. The stiff hinges supporting the upper carbons are bolted to two disks of asbestos-board, one of which is inside and the other outside the reflector, at the back. The two lower tubes are rigidly mounted in the asbestos disks, and connected by brass straps to their respective binding posts. Drive fits are used in assembly, as the tubes sometimes get too hot for ordinary solder. Silver solder may be used, if necessary. The live parts are all insulated from the reflector by means of the asbestos-board disks, which are held in place by two small machine screws. The reflector is an aluminum pan available in almost any stock of aluminum kitchen utensils. The insulating knobs on the rear ends of the carbons are available in stocks of radio parts. The resistor used in series with the arc-lamp is a Westinghouse Type M edge-wound resistor of 5.1 ohms, Style No. 389080, with two terminals, Style No. 475520. It is mounted on a base of asbestos-board made especially for this purpose.

Third-Dimension Magnetographs

Sometimes magnetographs showing paths of leakage flux in a plane perpendicular to the surface of the welded plate are useful. For instance, when a welded seam runs vertically it is hard, if not impossible, to get a good magnetograph on the vertical surface, since the iron powder will not stick unless the weld is very bad. However, the paper can be folded to a right angle and supported against the weld like an L, and the iron powder sifted upon it. This procedure produces an ordinary magnetograph on the part of the paper against the vertical plate, and a "third-dimension magnetograph" on the horizontal shelf of paper perpendicular to the plate. When using this method it is particularly advantageous to have the electromagnet on the opposite side of the plate from the paper and iron powder. Fig. 3 was made in this manner, on a vertical weld having very poor fusion.

Fig. 4 is a third-dimesion magnetograph of the edge of a good weld specimen (C2), made by laying the electromagnet on its side, sticking the weld specimen on its pole ends, and laying the Van Dyke paper on the edge of the specimen. The magnet used in making this magnetograph had a rigid core, and one end of the specimen was somewhat bent in shearing, so that the air gaps between the specimen and the magnet poles were unequal, producing the distorted, unsymmetrical leakage flux as shown. This result is one of the disadvantages of a rigid core in the electromagnet, particularly when the magnet and the paper must be placed on the same side of the welded plate.

Fig. 5 shows, for comparison, third-dimension magnetographs of the edges of a fairly good weld and of a poor weld, partially cracked. These two specimens were milled out of good and bad parts of the same welded seam, and both magnetographs were made on the same laminated flexible magnet, with the same number of ampere-turns magnetizing force.

As a method of testing welds the third-dimension magnetograph is not so satisfactory as the ordinary method, but is sometimes useful, as when the welded plate surface cannot be placed in a horizontal plane.

Test Results on Weld Specimens

In an effort to learn to "diagnose" welds from their magnetographs, a few good weld specimens and several poor ones containing certain specified faults were made up from ½x5-in. hot-rolled open-hearth steel bars, machined to a 30-deg. bevel for V welds (except specimens No. 11 and 12, which were not beveled).

They were manually arc-welded, using bare welding wire. Specified compositions of the plate and welding electrode materials are given in Table 1.

After welding, the specimens were milled in two, making two specimens presumably alike, each ½ in. by approximately 2⅜ in. in sectional area. The welding was done to the specifications in Table 2.

Preparing Specimens for Testing

The welds of the odd-numbered specimens were ground down flush with the plate surface, while the even-numbered specimens were left as welded. All four of the good specimens were ground flush, as magnetographs made on the surface as welded are not sensitive to slight faults. After making Van Dyke magnetographs of each specimen, on both sides, the poor weld specimens were broken in a tensile-testing machine just as they were, while the good specimens, A2, B2, C2, and D2, were machined into tensile test pieces of the form shown in Fig. 6, designed to insure breaking at the weld.

Four similar machined tensile-test pieces were made from the same steel-bar material, without welds, and broken in the tensile-testing machine to determine the physical properties of the parent metal alone. The four agreed closely, giving an average yield point of 30,675 lb. per sq. in. and ultimate tensile strength of 50,650 lb. per sq. in.

The four good welds showed an average yield point of 41,375 lb. per sq. in., and average ultimate tensile strength of 57,725 lb. per sq. in., and average elongation in one inch

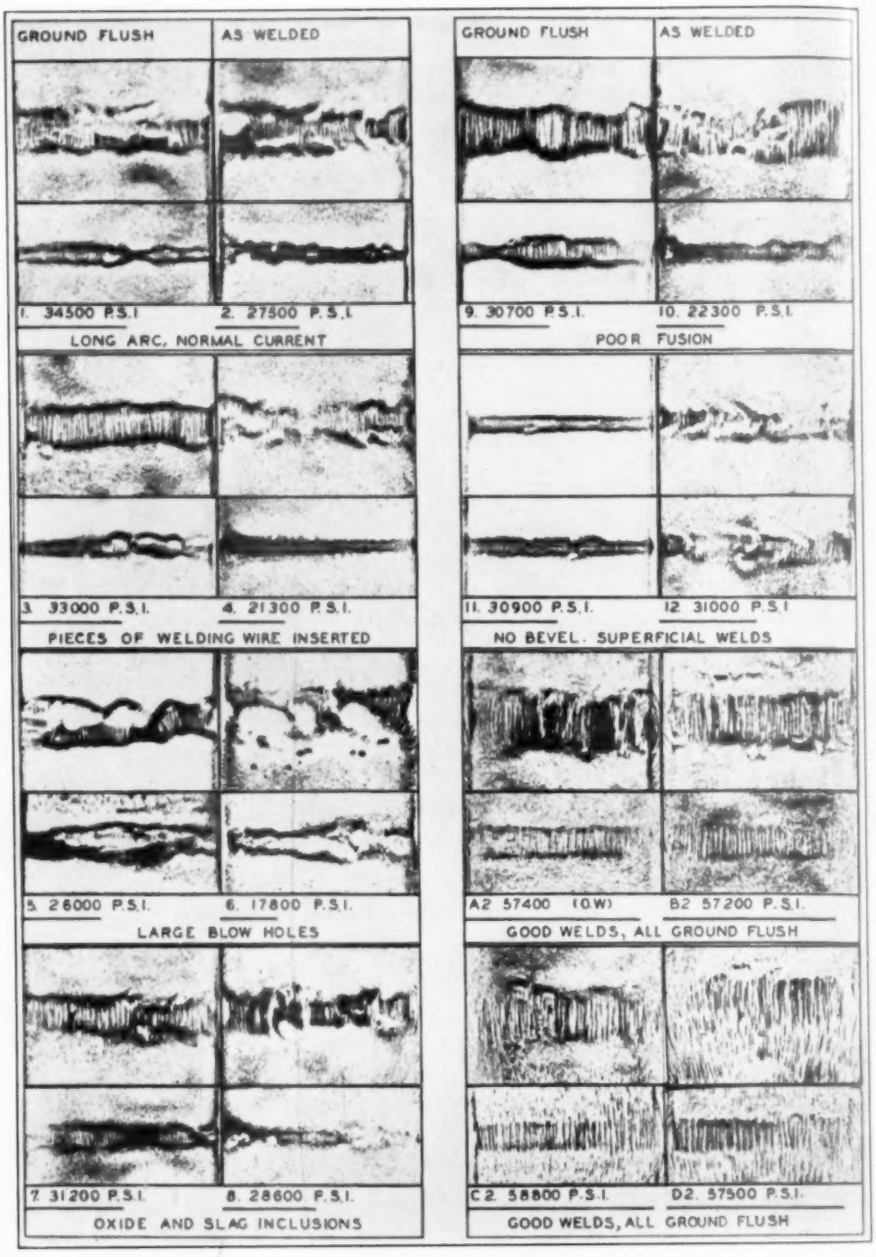


Fig. 7. Summary of Magnetographic Study of Weld Specimens.
(Relative welded strengths are shown graphically by the length of the line under each notation.)

Table 1. Composition of Materials

	Steel Bars	Welding Electrode
Carbon	0.08 to 0.18%	0.12 to 0.18%
Manganese	Max. 0.55%	0.40 to 0.55%
Phosphorus	Max. 0.05%	Max. 0.05%
Sulphur	Max. 0.06%	Max. 0.05%
Silicon		Max. 0.08%

Table 2. Specifications for Welding Specimens

Specimen Numbers	Welding Specifications
1, 2	Long arc, but normal current.
3, 4	Pieces of $\frac{3}{16}$ inch welding wire inserted to fill in.
5, 6	Large blow-holes in weld.
7, 8	Oxide and slag inclusions.
9, 10	Poor fusion. (Current low.)
11, 12	No bevel. Penetration insufficient to close gap.
A2, B2, C2 D2	Good welds. (Each from different specimen.)

of 16.5%. Specimen A2 broke outside the weld. The other three fractures were near the edges of the welds, through both weld and parent metal.

Magnetographic Analysis of Specimens

Fig. 7 summarizes the magnetographic study of all the weld specimens, showing both top and bottom of each weld, the difference in results on surfaces ground flush and as welded, and notes giving the weld specifications and the ultimate tensile strength in pounds per square inch. The strength is also shown graphically by the length of the line under each notation. The magnetographs were made on a magnet having a laminated core of approximately 1.56 sq. in. sectional area, and 6½ in. clearance between poles.

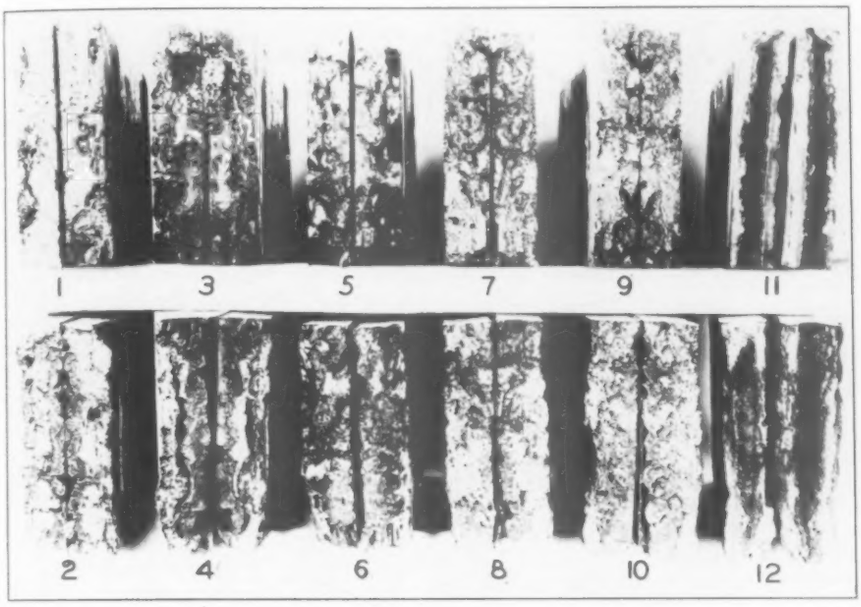


Fig 8. Fractures of Poor Weld Specimens Described in Fig. 7.

Fig. 8 shows the fractures of the poor weld specimens, and gives some idea of the relative seriousness of the faults. Examination shows that specimens No. 7 and 8, specified to contain oxide and slag inclusions, really did not contain much visible foreign substance (having been welded with bare electrode).

Specimens No. 1, 2, 3, 4, 6, 8, 9, and 10 all show a little unfused surface of the machined bevel, and judged by visual examination, on the basis of unfused area alone, they appear to fall in the following order, ranging from worst to best:

$$4\ 10\left\{\begin{matrix}9\\8\\2\end{matrix}\right\}6\ 3\ 1$$

Specimens No. 11 and 12, having no bevel, had unfused strips purposely left along the center. The weld metal, as far as it went, was good.

It will be observed that the specimens which were ground flush look worse in the magnetographs than the similar specimens which were left as welded; but that the ground specimens, with one exception, were stronger than the similar specimens having a little reinforcement. The exception, in specimens No. 11 and 12, is easily explained, as the grinding of No. 11 removed a large percentage of the weld metal, as shown in Fig. 8.

Tests of Specimens with Surfaces Left as Welded

For all the even-numbered specimens (having surfaces left as welded), the ultimate strength in pounds per square inch was calculated on a basis of ½ in. thickness. The ultimate strength in pounds per square inch of the specimens ground flush was calculated on the basis of the actual sectional area at the weld, carefully measured. However, there is so little difference in the sectional areas of the different specimens, as used for calculating the ultimate strength, that the gross loads in pounds are substantially proportional to the respective figures stated in pounds per square inch. The increase in strength produced by grinding flush is explained by the concentration of stresses in the specimens having the rough, uneven weld surface.

Obviously, since the welds ground flush look worse but are actually stronger, the interpretation of magnetographs requires some experience and judgment, with consideration of the character of the weld surface and the amount of reinforcement. There is, of course, a certain amount of reinforcement which, in spite of the rough surface, makes the weld just as strong as if it were ground flush. The sensitivity of magnetographic inspection decreases with increasing height and roughness of the reinforcement, so that under practical working conditions the magnetograph can hardly be expected to reveal minor faults.

In a V weld, poor fusion is most likely to be at the bottom of the V. Furthermore, the bottom surface is relatively smooth and flat. Therefore, magnetographs taken at the bottom of a V weld are the most sensitive of any that are practicable under ordinary shop conditions.

Conclusions

Magnetographic inspection is valuable on butt welds, especially if it can be applied at the bottom of a V weld.

On a rough surface, as welded, it is not sensitive enough to reveal anything but serious faults.

Its best feature is its detection of lack of fusion. Other faults, such as uniformly poor deposited metal, are not very well revealed.

The method is sensitive on a horizontal surface only.

The results of attempts to apply the method to other than butt welds have been disappointing.

GETS CONTRACT FOR FIVE PIPE LINES

The Welding Engineering Company of Bartlesville, Oklahoma, has been awarded contracts for electric welding the following pipe lines:

Continental Construction Corporation, 303 miles 24", part of Panhandle-Chicago Gas Line. General Contractors, Bechtel & Kaiser, Henry L. Lemons, Inc., and Sheehan Pipe Line Construction Company.

Cities Service Gas Company, 32 miles 20", Dillworth, Oklahoma, to Wellington, Kansas. General Contractors, Sheehan Pipe Line Construction Company.

Missouri-Kansas Pipe Line Company, 15 miles 18" and 8 miles 20" in the Texas Panhandle. General Contractors, Williams Brothers.

United Gas Company, 44 miles 18" and 15 miles 16", Refugio, Texas, to Kennedy, Texas. General Contractors, F. C. Youmans.

United Gas Company, 15 miles 16" and 15 miles 12", Converse, Texas, to San Marcos, Texas. General Contractors, The Sexton Corporation.

LEIPZIG HAS WELDED-BUILDING CODE

The first large German city to accept a code for welded steel buildings is Leipzig. This city adopted its code in January, 1930.

A BIG WELDING MEETING

The entire program of the first fall meeting of the Meriden, Conn., Section of the A. S. M. E., held on October 8th, was devoted to a series of welding subjects. An official estimate places the number of men attending the meeting at 640.

The meeting was opened by Kirkland Decherd, chairman of the local Meriden Section, who after greeting and welcoming the delegates, dealt briefly on the purpose of the meeting. Mr. Decherd then turned the meeting over to the Entertainment Committee chairman, J. D. Tierney, president of the Storts Welding Co., Meriden, who outlined the program for the evening to the delegates.

M. W. Brewster, of the General Electric Co., who was in charge of all General Electric features of the program, described the ammonia hydrogen dissociator and its uses. He familiarized the audience with two processes for their own localized manufacture of hydrogen, one known as the dissociated ammonia and the other as the electrolene process. He also briefly described the function of a new electric brazing unit, and explained the process of the talkie movie, "Atomic Hydrogen Welding," and the actual demonstration on both subjects.

The talkie moving picture, the first feature of the program, proved very interesting because it impressed the audience with the fact that the atomic-hydrogen process of welding was not discovered and understood through a simple process of deductions, and the presentation as given by Dr. Irving Langmuir and his aids was a fitting introduction to the atomic-hydrogen arc-welding demonstration because it prepared and educated the audience to better understand the demonstration when they saw it. At the conclusion of the picture, the audience was invited to visit the various temporary booths and witness the welding processes at their own convenience. Actual demonstrations included:

The atomic-hydrogen arc-welding process, with Mr. Shaw of the General Electric Co. operating. In this demonstration Mr. Shaw welded various metals and alloys, and his performance was aided by Mr. Brewster and other representatives of the General Electric Co., who explained details and answered questions.

G. E. Gifford of the General Electric Co., demonstrated a new brazing unit known as an electric brazing tool.

An exhibit of copper-brazed products which were sent to the meeting from the National Metals Congress by the General Electric Co., was displayed and representatives of the company explained the copper-brazing process in which hydrogen atmosphere is used in a furnace.

J. J. Farnan of the Storts Welding Co., demonstrated the oxygen-hydrogen process of lead welding.

L. C. Carlin of the Stoody Company, of Whittier, Calif., introduced and demonstrated to the spectators how hard-facing-alloy materials can be deposited by arc welding and oxy-acetylene welding for use where abrasion and shock rapidly deteriorate softer metals. Mr. Carlin was assisted by Billie Kumpel, Jimmy Garvey and Al Jamieson, welding operators of the Storts Welding Co.

Archie Pennell and Stanley Uliasz of the Storts Welding Co., demonstrated general arc-welding problems, featuring arc welding of pipe joints.

Amie Des Roberts, an operator from the Storts Welding Co., demonstrated general oxy-acetylene welding problems, featuring oxy-acetylene welding of pipe joints. This latter demonstration was made all the more interesting when it was found that some spectators had brought along some of their own special problems for the demonstrator to work out. In each case satisfactory procedure control was demonstrated.

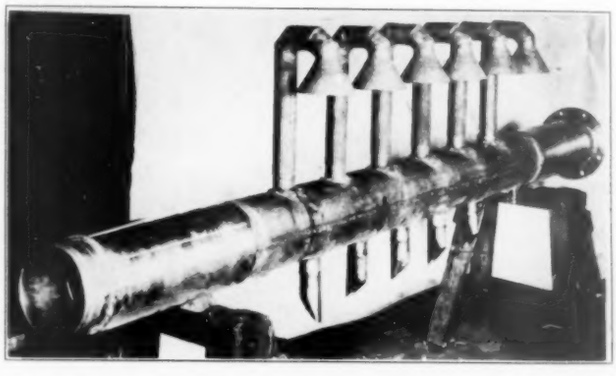
William Dubee of the Storts Welding Co., demonstrated the uses of a special plate cutting tip made by the K-G Welding & Cutting Co., of New York. This tip is specially designed to allow a cutting operator to cut a very clean, true cut on heavy sheets and plates.

Miss Maude Ives and Miss Avis Lipfert of the Storts Welding Co. office staff, helped to make the meeting successful by giving their time and attention to providing information relative to welding literature such as *The Welding Engineer*, the "Welding Encyclopedia," and some other eight or ten welding reference books. These young ladies also took, on specially prepared questionnaire blanks, typewritten copy of any questions pertaining to welding problems on which spectators desired to receive some information.

The meeting opened at 7:45 and continued without interruption or delay until 11:00 p. m.

ARC WELDED STAINLESS-STEEL HEADER

One of the interesting welding jobs submitted for competition in the recent photographic contest conducted by the Stoody Company, of Whittier, Calif., was the entry of J. J. Donohue, of the Pittsburgh Supply Co., 1115-17 Metropolitan St., Pittsburgh, Pa. This header was made from 18 per cent chrome and 8 per cent nickel steel. At the time it was made, it was impossible to secure seamless drawn



Many Welded Pieces of Chrome-Nickel Steel Are Used in This Header.

tubing for use on the header, so it was necessary to weld up all the various tubes of different-size plates.

The header proper was formed from nine separate pieces of plate. The left threaded end was made of $\frac{5}{8}$-in. plate 8 in. long. The bearing end was made of $\frac{5}{8}$-in material, and has a slightly larger diameter, and was fully ground and polished for a distance of 27 in. The center section carrying the goose necks and outlets was made of three sections of $\frac{3}{8}$-in. plate formed and with the center baffle welded in. The other sections were made the same as the sections on the left. The goose necks and outlets were made of $\frac{3}{16}$-in. metal formed and welded, mitered joints being used on the goose necks proper. Bosses were welded in for the screwing of the goose necks and the outlets.

This header was made up for installation where acid conditions were severe. All the welds had to be air-tight to a small pressure. The entire assembly was welded by the metallic arc process.

These headers were formerly made of castings, but it was impossible to secure castings of this size and of peculiar arrangement of chrome and chrome-nickel alloy steels. The shop not only delivered the customer what he wanted, but in fabricating it in this manner they delivered him a header that weighed just about one-third of the former cast headers. This was a considerable item in saving in both cost of installation and support in operation.

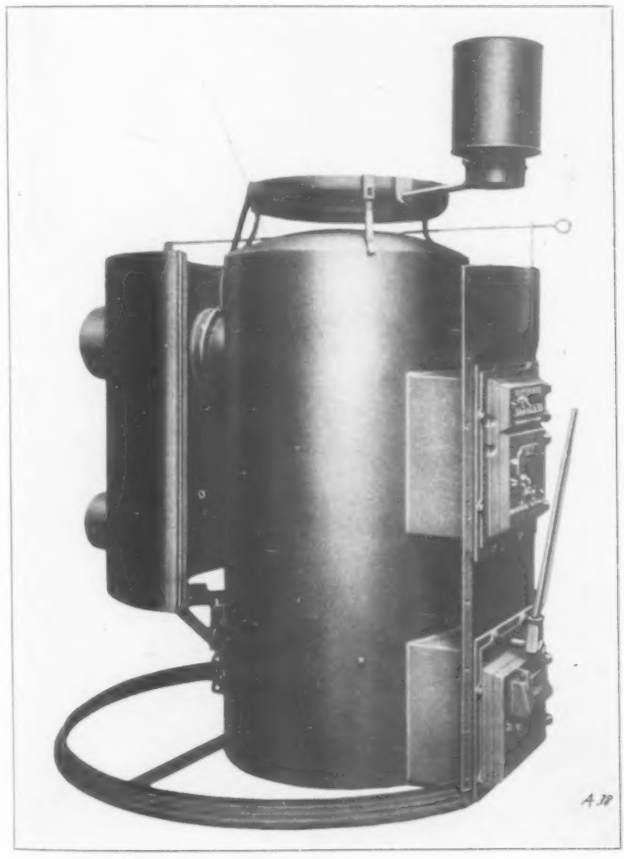
Never a Gas Leak in Welded Furnaces

Gas-Tight Seamless Steel Furnaces Are Guaranteed for Ten Years of Service—Careful Supervision Maintains High Quality in Workmanship

SINCE the first warm air furnace was built there has been an almost constant attempt on the part of manufacturers to make furnaces permanently gas and dust tight. The common practice in warm air furnace construction is to make furnaces up in sections, setting one section upon the other, much like a sectional bookcase, but using what is called "furnace cement" in the joints. A joint in a furnace has been quite aptly described by one manufacturer as a crack put there by the designer because he knew that if he did not put the crack there, the forces of nature would do so. The crack in the furnace is, therefore, there to allow for differences in expansion and contraction—another term for which is unequal movement of one part against another.

Inasmuch as there must be room for movement, there must be more space than just enough for a perfect fit. Cement will dry out and harden and pulverize with the constant forces of expansion and contraction. This explains the great difficulty of keeping a sectional furnace gas-tight.

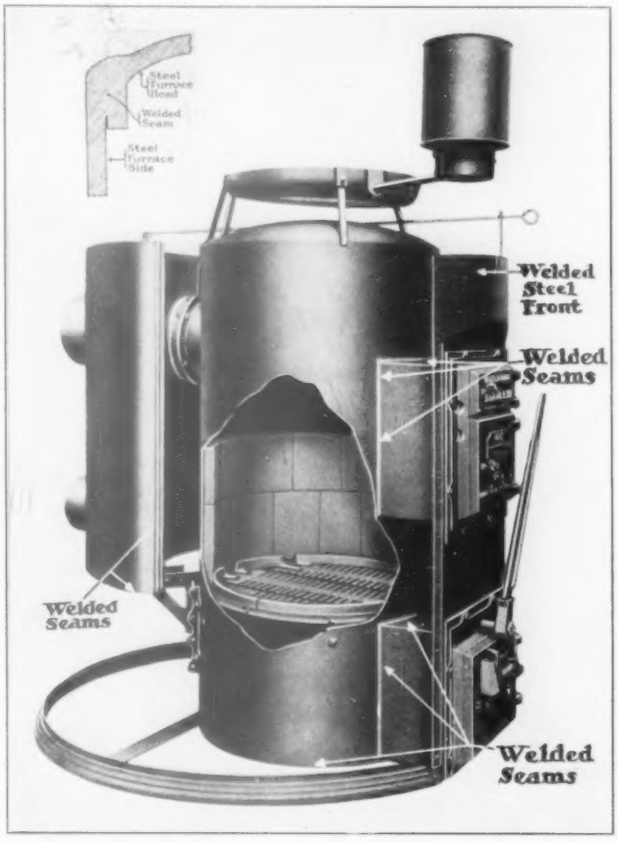
Years ago some furnace manufacturers concluded that



The Welded Construction of the Waterbury Seamless Furnace Prevents All Possibility of Leaky Seams.

if furnaces were made of steel with parts riveted together it would be possible to eliminate the necessity for so many joints. Steel, owing to its greater ductility, will not crack with the differences in expansion and contraction, and it is possible to so design a steel furnace that this expansion and contraction can be largely absorbed without dangerous strain on the parts of the furnace. But riveting had its drawbacks, and it was still the practice with riveted furnaces to use some cast iron sectional parts, bolted to the steel furnace shell.

In 1919, the Waterman-Waterbury Company, of Minneapolis, came to the conclusion that furnaces could be welded, thus eliminating the necessity for rivets and the necessity



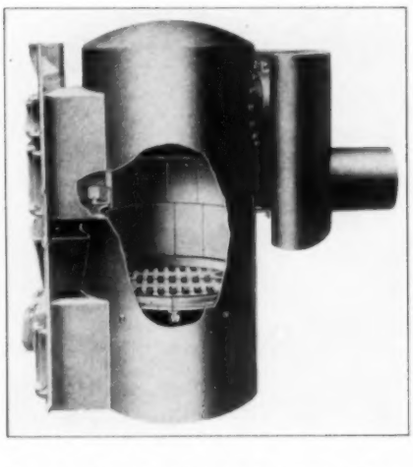
Showing the Location of Important Welds. The Insert at the Top Shows the Weld to Be the Strongest Part of the Whole Assembly.

for sectional parts made of cast iron. This idea has been responsible for one of the most rapid growths in the history of the furnace industry. From the original idea the Waterman-Waterbury Company has perfected processes whereby they now weld their entire furnace body, front, feed and ash chutes—body and all into one solid seamless piece. There is no joint in this furnace body inside the furnace casing. The same is true of the furnace radiator, which is fully welded, including smoke collar and cleanout collar.

Company Guarantees Joints Will Remain Gas Tight

So great has been the success of this plan that the Waterman-Waterbury Company is enabled to guarantee the Waterbury Seamless Furnace to be permanently gastight. Thus the art of welding is responsible for one of the first major improvements in warm air furnace construction in a generation.

It is interesting to note that the manufacturers guarantee



Another Waterbury Product Called the "Radio" Furnace, in Which Welding Also Provides Gas-Tight Construction and Long Service.

the steel parts of this furnace, when installed in accordance with the provisions of the Standard Code, for a period of ten years.

When it was determined that welded construction was to be an important part in the manufacture of the new type of furnace it was, of course, necessary to make a thorough study of the fundamentals involved in production welding and to get a welding program completely organized. It was also necessary to provide the right equipment and working conditions so that production costs could be kept down and quality and uniformity of workmanship maintained just as carefully as in other manufacturing operations.

At the present time the equipment for welding in the Waterman-Waterbury plant provides for fourteen oxy-acetylene welders. In order to avoid the necessity of having the welders interrupted in their work to handle cylinders, oxygen and acetylene are supplied to conveniently lolene are piped to conveniently located welding stations.

All Welded Home Heater.

Jigs and Clamps Make for Economy and Uniform Results

Another part of the equipment, which has much to do with controlling the economy of the process and uniformity of results, is the use of jigs and clamps. Suitable holding devices have been developed for all of the various assemblies involved in the construction of a complete line of furnaces, and it is a part of the program to see that all work is properly set up before welding is started. The jigs are so constructed that it is not necessary to use back-strips to absorb excess heat during welding and no difficulty is encountered from buckling.

The sheet metal used in the construction of these furnaces is from 10 gage to 3 gage. It is purchased on a rigid specification which insures good welding quality; and since all welding is done on new metal, there is no expense for cleaning before welding.

The design room contributes its share to the success and economy of welding. All welds are located so that there is no necessity for grinding off or polishing any of the welds before finishing. The work is laid out so that practically all of the welding is done in a flat position. Some of the welds are edge welds and some of the fillet type. All of the work, except the edge welding, requires a $\frac{3}{16}$-in. rod as filler.

The results obtained from welded construction have been so satisfactory that the Waterbury furnace is strongly featured in advertising matter and catalogs as a welded product. This success is not an accidental development, but comes as a result of a thorough investigation of the correct methods of applying welding in production. The management finds that it is possible to keep on making improvements in welded construction and in the assembly program. It is also possible in the designing room to make occasional changes in the designs which have their effect upon the efficiency of the welding operations.

In this type of furnace construction, it is not necessary to run tests on the completed job. When it has been demonstrated that the workmanship is satisfactory, there is no doubt regarding the quality of the finished product. Therefore, particular attention is paid to the ability of the welders themselves. When it is necessary to secure now operators, they are sometimes hired from the outside and sometimes trained in the factory, depending upon how much time there is available for securing new help. In either case, the ability of the welders is tested at regular intervals after they get on the job. Knowing that these tests are standard practice in the factory, they use care and form the habit of good workmanship, so that they will not be liable to be disqualified after a short period of employment.

The illustrations show a few of the principal products of the Waterman-Waterbury plant. One of these is the seamless heater and the cutaway illustration gives a good idea of the simplicity of the design of the welded steel body. Another type of furnace shown is called "The Waterbury Radio Furnace" where the application of welding is again apparent. A third type is the Waterbury Home Heater. This is an all-welded product and is highly desirable for residence heating.

The Home Heater With Front Doors Closed, Showing the Attractive Appearance Which Makes This Heater Desirable for Home Use.

Spot Welding Makes Speedy, Neat Work

Whether the Material Be Stainless Steel, Mild Steel, Galvanized Sheet, or What Not, the Chances Are the Article Can Be Successfully Welded

THE two chief factors in competitive trade are quality and price. Because spot welding has a favorable effect on both these factors, it has been adopted by many manufacturers for production work in thin-gage materials.

A great variety of metal products are being fabricated by the spot-welding method in the plant of the Chicago Metal Manufacturing Co., 3724 S. Rockwell St., Chicago, Ill. These products if made by any other method would entail greater costs and would be in some respects inferior to the spot-welded product. These include radio cabinets, stands of various types, desks, filing cabinets, covers for radio condensers and transformers, pipe, fan casings, gear guards, etc.

These products are built to the buyers' specifications, and a great many different kinds of metal are specified in their construction. Oftentimes mild steel is used, as well as monel metal, Duraloy, Ascoloy, Enduro, Allegheny metal, other stainless steels, and galvanized sheets.

Alloys Can Be Easily Spot Welded

Except in the case of galvanized sheets, no difficulty is encountered in the spot welding of these various metals, and frequently one metal is spot welded to a sheet of another entirely different composition. To obtain the best results with galvanized metal, the upper electrode is filed to a sharp point and more pressure is used than for the same gage of uncoated sheets.

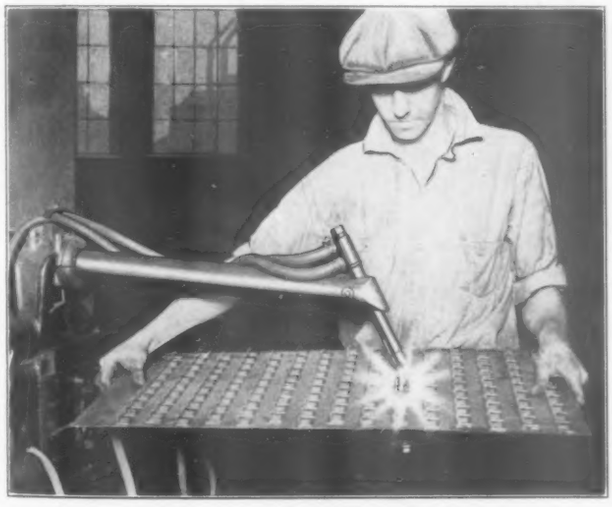


Fig. 1. Lugs Are Speedily Spot Welded Onto Sheets, Making a Neat Finished Job Without Warpage.

Only white pickled sheets are used in the case of stainless steel, as they must be absolutely free from scale.

The Chicago Metal Manufacturing Co. has been using the spot-welding method of fabrication ever since the firm's incorporation in 1922, and they also employ gas and arc welding on a large scale. They specialize in the manufacture of special equipment for industrial concerns and offices. They also offer an unusual type of welding service, in that other equipment manufacturers whose use of spot welding is not extensive enough to warrant the installation of a spot welder can have their products spot welded at this plant, thus saving the difference in cost between spot welding and riveting. Moreover, the Chicago Metal Manufacturing Co. offer to their customers as well as to all others the use of their spot welding department as a sort of laboratory, to determine the feasibility of spot welding various metals or solving other problems pertaining to spot welding.

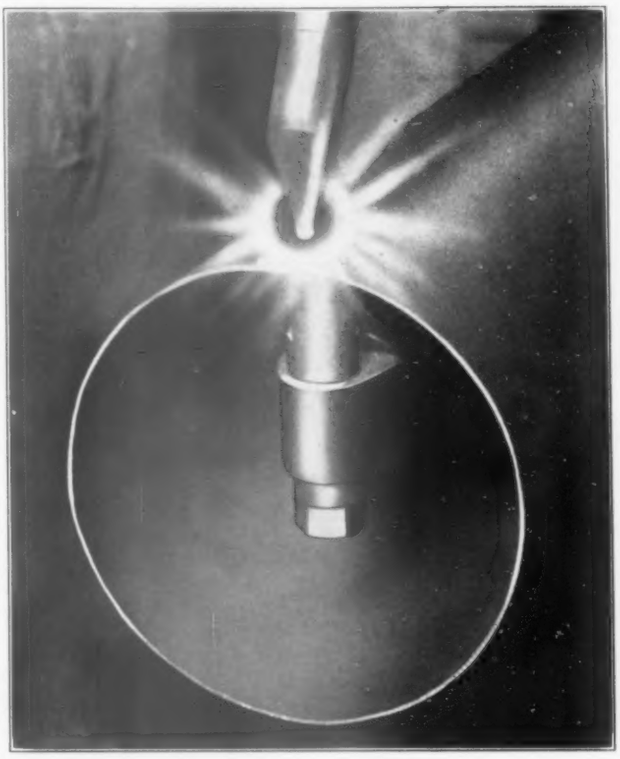


Fig. 2. Spot Welding the Longitudinal Lap Joint in a Pipe Formed of Stainless-Steel Sheet. The Electrodes Are Pointed With a Tungsten Alloy, Making for Long Life.

Fig. 3. Map Cabinet, Entirely Spot Welded.

Intricate shapes can usually be spot welded, as the machines are so made as to allow a complete adjustment of position of the parts in work.

The illustrations give some conception of the wide variety of special articles that this company is fabricating by spot welding. The steel panels for shelving, doors, lockers, etc., shown in Fig. 3, have the narrow stiffener panel and all lugs spot welded in place. The map cabinet in Fig. 4 is entirely spot welded.

An interesting piece of office furniture is the cost-record-card file shown in Fig. 5. The cabinet, file drawers, and

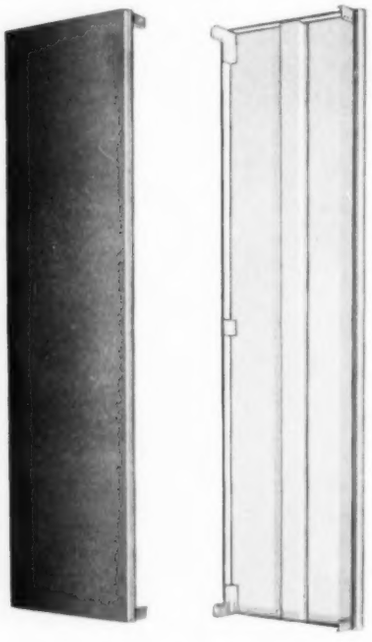


Fig. 4. These Spot-Welded Steel Panels Have a Great Variety of Uses. Note the Neat Finish Made Possible by This Method of Fabrication.

stand are completely spot welded, there not being a single rivet in the entire construction. This is a sturdy piece of furniture and is neatly finished.

Such equipment as radio cabinets, lockers, filing cabinets,

Fig. 5. The Case, Drawers, and Stand of This Cost-Record Card File Are Spot Welded.

etc., must be made with appearance as a prime consideration. The smoothly finished surface of such devices, as witness that of the panel in Fig. 3, is made possible only by means of spot welding. Riveted joints involves the

Fig. 6 (Right). Special Cabinet With Tray Shelves.

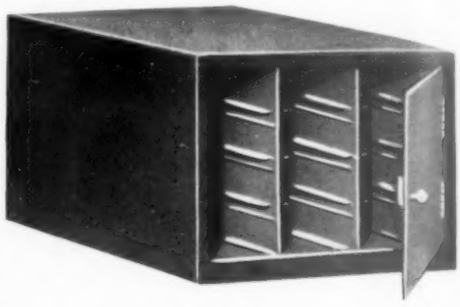
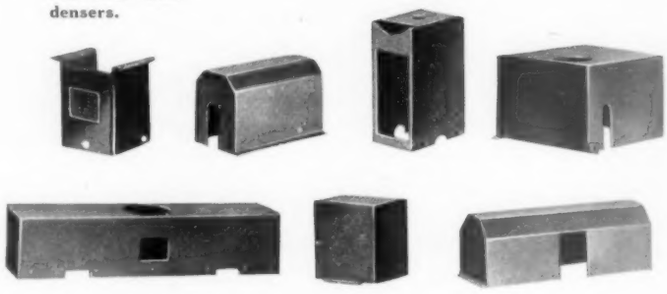


Fig. 7 (Below). Examples of Spot-Welded Covers for Radio Transformers and Condensers.



projection of unsightly rivet heads, unless the metal is countersunk to receive a countersunk head, in which case the head is apt to pull through whenever much strain is put upon it; and in any case it will probably work loose, with the result that the enamel around the head becomes marred or chipped and the loose parts rattle.

On a spot-welded article the enamel or lacquer coat

Fig. 8. The Construction of This Steel Fan Casing Is Greatly Facilitated by Spot Welding.

presents a smooth finish that is very pleasing to the eye. The location of the spot welds cannot be seen on the finished surface, and they are but slightly visible on those surfaces that remain unfinished.

The special cabinet with tray shelves, shown in Fig. 6, is also an all-spot-welded job, as is also the collection of

covers for radio transformers and condensers shown in Fig. 7.

Fig. 8 is an interesting example of industrial equipment formed by spot welding. The two plates forming the sides of this fan casing are joined around their edges to a channel-shaped strip formed from the same gage of metal and bent to fit. The dots shown around the periphery indicate the location of the spot welds.

BOOK REVIEWS

MARKS' MECHANICAL ENGINEERS' HANDBOOK—Third Edition.

Rapid development in the mechanical-engineering field has taken place in the six years just past—since the second edition of this standard work came out. Some of this development has been in the nature of revision of existing data, such as properties of steam at high pressures and high temperatures; rapid development has also taken place in welding and other special fields; the theory of vibration has been further developed during these years; and other phases of engineering, such as coal carbonization and industrial furnaces, have attained such importance as to demand special consideration. To accommodate this material it has been necessary to enlarge the book by about 270 pages.

All sections of the book have been revised to conform to the latest practice. The third edition has 16 sections, each divided into sub-sections. Each sub-section is written by a well-known authority in that field. The contributors now number 70 in all.

The sub-section on Welding was prepared by W. Spraragen. It takes up, in order, arc welding, gas welding, gas cutting, resistance welding, and thermit welding. Information is given on welding procedure, metals and their preparation for welding, welding and cutting speeds, strength of welds, welding symbols, energy consumed in resistance welding, etc. This section on Welding shows careful preparation on the part of the author, who has succeeded in condensing into 21 pages such information on good weld procedure and welded design and economics of welding as are essential to the mechanical engineer's knowledge.

This book is 4½x7 in. in size, contains 2,264 pages, including a comprehensive index, is bound in a flexible binding, and may be obtained at $7.00 the copy from the publisher, the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y.

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REPORT OF BRITISH ACETYLENE ASSOCIATION.

This is a report on the recent progress of the oxy-acetylene industry in Great Britain and the British Dominions, presented by the British Acetylene Association at the International Acetylene Congress held at Zurich, Switzerland, July 9th to 12th. This is the first attempt to embody in a single document a comprehensive account of the advances made in oxy-acetylene welding and metal-cutting in the British Empire as to technical training of operators, applications of the processes in industry, and manufacture of equipment and materials.

The report is divided into three sections, the first dealing with the training of welders in classes conducted by schools and industries, and with promotion of welding by traveling demonstration vans.

The second section of this report deals with the application of the oxy-acetylene torch in industry, the procedure adopted being the separate consideration of some forty of the major industries with a view to determining the manner and extent to which they employ it. The use of oxy-acetylene welding for the repair and maintenance of equipment is common to all the trades considered. To a greater or less degree almost every industrial undertaking in Great Britain above a certain size utilizes welding for this purpose, and the value of the process as a time- and labor-saving operation is very widely recognized.

The structure and operations of the oxy-acetylene trade itself are reviewed in the third section of this report, which also deals with the activities of manufacturers and suppliers of welding and cutting equipment and materials, and gives information on production and consumption of gases in the Empire. Altogether, it is apparent that educational authorities, technical societies, manufacturers, government departments, and industry as a whole, are working together for the continued expansion of the use of the oxy-acetylene process.

This report, published in book form, is 5½x9 in. in size, contains 195 pages, and may be obtained at 7 s. 6 d. ($1.80) each from The British Acetylene Association, 12, Russell Square, London, W. C. 1, England.

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GERMAN-ENGLISH-ITALIAN TECHNICAL DICTIONARY, by Hubert Hermanns, Wilhelmstrasse 114, Berlin SW 48, Germany.

In this, the second, edition, this work has been enlarged to include many words being used in present-day technical literature that were not given in the previous edition. This edition contains more than 8,000 words and phrases from metallurgical, foundry, factory, and workshop practice. This is not a complete dictionary in itself and is intended to be used only to supplement a regular dictionary or to assist the reader of English, German, or Italian who may not be acquainted with many of the technical terms in these languages. The book is 4¼x6 in. in size, contains 411 pages, and may be obtained from the compiler for $3.75.

SECOND LINCOLN ARC WELDING PRIZE COMPETITION IS ANNOUNCED

Designers and engineers in every industry where iron and steel forms all or a part of the manufactured product are again given the opportunity by The Lincoln Electric Co., Cleveland, Ohio, sponsors of the Second Lincoln Arc Welding Prize Competition, to show their skill and ingenuity in utilizing the advantages of arc-welded construction. As a reward for their efforts $17,500 will be awarded for the 41 best papers submitted in the competition. The Jury of Awards, who will judge the papers entered in the competition, will be composed of the Electrical Engineering Department of Ohio State University under the chairmanship of Professor Erwin E. Dreese, head of the department, and such others as he may select.

In announcing this competition, the second of its nature, The Lincoln Electric Co. is establishing a biennial competition which should be welcomed by industrial engineers and manufacturing executives throughout the world. The purpose of this competition is to stimulate designers and engineers in every line of industry to think of the manufacture of their own products by the use of arc welding and to increase their knowledge of the feasibility of its application.

The forty-one prizes to be given by The Lincoln Electric Co. to the winners, as selected by the Jury of Awards, are: for the first prize paper, $7,500; for the second prize paper, $3,500; for the third prize paper, $1,500; for the fourth prize paper, $750; for the fifth prize paper, $500; for the sixth prize paper, $250; and for the seventh to forty-first prize papers, $100 each.

The competition as announced will be open to any person in the world except the employees of the sponsors. The closing date for the competition will be October 1, 1931. Other details of the rules of the competition are expected to be announced shortly.

Last Year a Prophecy--This Year a Reality

LESS than a year ago Bennett Chappel, Publicity Director of the American Rolling Mill Co., created considerable interest during his keynote address at the annual meeting of the International Acetylene Association when he predicted the use of steel as a base for highways in the future. This year has seen the completion of the first strip of such a highway. It was described in detail in the September issue of *The Welding Engineer*. The first picture at the top shows the first complete span of the roadway. At the right a welder is shown welding the galvanized, corrugated sheets of the first section together. Each sheet is welded twice on each side and once on each end as well as at each corner. Below this view is a closeup view of the welder at work. In the lower right hand corner is a picture of a representative group of steel engineers and highway engineers who attended the construction of this new type of highway. The lower left-hand picture is another view of the first 150 foot section.

Photographs by courtesy of the American Rolling Mill Co.

Production Welding of Chrome-Nickel Alloys

All-Welded Chrome-Nickel Tanks Show Good Construction and Workmanship and a Striking Appearance

By W. J. Wachowitz*

THE fabrication and welding of chrome-nickel alloys for the dairy, chemical, laundry, cannery, and packing industries, as carried on in the plant of the Alloy Products Corp., of Milwaukee, Wis., requires an intimate working knowledge of welded design and procedure. Our extensive line of products is the result of many years in research and development work on the fabrication and welding of various alloys, mainly the so-called 18-8, known as Allegheny metal.

We employ both oxy-acetylene and electric-arc welding, oxy-acetylene being used mostly for light gages and arc welding for the heavier gages, and special welding equipment is used.

All arc welding of chromium alloys is done with reversed polarity. The sheets are laid out before welding in such a way as to allow expansion and contraction where the butt-welding method is used. The sheets are also preheated in order to take out the moisture and chill that may be on them. The chrome-nickel alloys melt at a very high temperature; hence, the contraction, after the source of heat is removed, is very rapid, and in order to make successful welds it is necessary to preheat before welding. The welding is done with a high amperage and a low voltage—just the opposite from ordinary steel—and the wire is coated with a special flux to avoid blowholes, to obtain penetration, and cause the metal to flow freely.

*President and General Manager, Alloy Products Corp., Milwaukee, Wis.

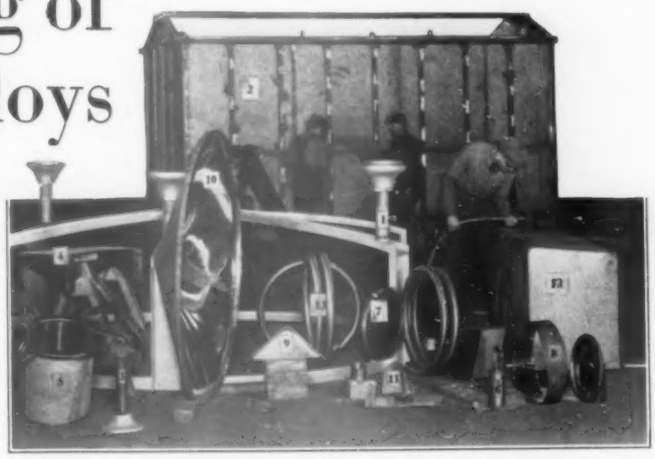


Fig. 1. A Variety of Welded Parts That Enter the Construction of Various Products.

Our all-welded products do not consist solely of chrome-nickel alloys; hence, a proficiency in the welding of other metals is required. For example, some tanks are constructed with welded aluminum sheets applied over the insulation, and welded channel iron is employed as tank supports and blue annealed steel for the bases of motors.

Some of the welded parts that go to make up our products are illustrated in Fig. 1, to show the diversity in design and materials that we use. In this illustration, No. 1 is a support for a round tank. This support is fabricated of 7-in. channel iron, rolled and formed with all joints welded.

Welded Chrome-Nickel Tank

No. 2 is a tank 14 ft. 6 in. long, 7 ft. wide, and 9 ft. high, built of 10-gage Allegheny metal, with all seams butt welded and ground smooth on the inside. The supports of this tank are made of 2-in. channel iron placed back to back and welded together. This tank holds 5,050 gal. and is one of the largest rectangular all-welded tanks ever built. The completed tank is covered with 2-in. cork-board insulation, which is protected by welded ⅛-in. steel sheeting. This tank has a 5-in. pitch on the bottom to facilitate draining. It was built for the Bowman Dairy Co., of Chicago.

No. 3 is an adjustable leg section of a tank support. It is made from a 4-in. channel to which is welded a 3-in. flange, the channel being shaped to the radius of the tank. No. 4 is an all-welded motor bracket made of ⅛-in. blue annealed steel. No. 5 is a small tank made of 14-gage Allegheny metal, with all seams butt welded and ground smooth on the inside. No. 6 is the outlet for draining tank No. 2, and is constructed of 3-in. Allegheny-metal pipe, all welded.

The dished and flanged bottom for tank No. 5 is indicated by No. 7. No. 8 is a ring used as a manhole in certain tanks. A corner construction of tank No. 2 flanged for butt welding is shown as No. 9. No. 10 is a cone-type bottom for a tank, with a 1¼-in. flange which is butted in and welded. A casting of Allegheny metal is shown as No. 11; this is used with various truck tanks and is also welded. No. 12 is a tank made of 14-gage Allegheny metal with flanged heads and all-butt-welded construction. No. 13 is a coil of 2-in. tubing of Allegheny metal used for heating purposes.

Fig. 2 illustrates a tank constructed of ⅛-in. Allegheny metal with all seams butt welded and ground smooth on the inside. This tank is 10 ft. in diameter and 10 ft. high in the shell. Both heads are dished 14 in. and flanged. The

Fig. 2. A 5,000-Gal. Storage Tank of Allegheny Metal, With Butt-Welded Seams.

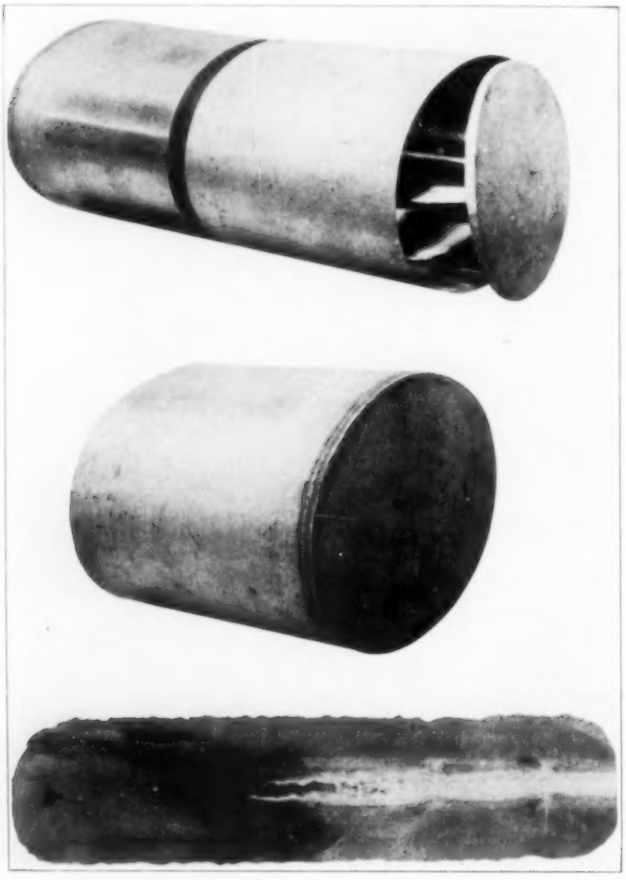


Fig. 3. Showing Assembly of Elliptical-Shaped Tank, and Close-Up View of Partly Ground Weld.

manhole and other fittings are completely welded, and no bolts or rivets are used in the entire construction. With a capacity of 6,300 gal., this is one of the largest chrome-nickel tanks ever built in an all-welded construction. It is used for milk storage at one of the Libby, McNeill & Libby plants in Waupun, Wis. The support for this tank is shown in Fig. 1 (No. 1), as is also the bracket (No. 4) for the motor which drives the agitator.

An elliptical-shaped tank having flanged heads, with some

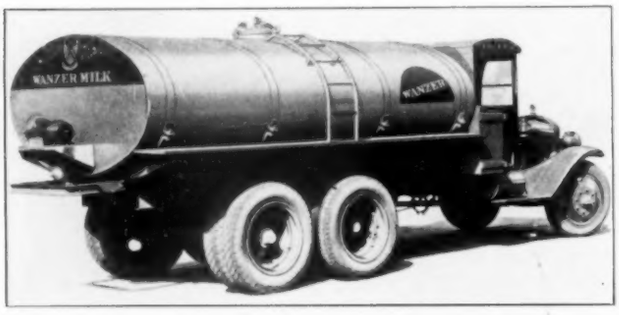


Fig. 4. Welded Milk Truck Tank of 2,000 Gal. Capacity, Made of Allegheny Metal, Insulated, and Covered With Welded Aluminum Jacket.

parts welded and other parts ready for welding, is shown in several views in Fig. 3. The lower view shows the longitudinal seam welded and partly ground. After this is finished, it is hard to find the place where the weld was made. We made tests of these welds and found that they were approximately 95% efficient.

Fig. 4 is a 2,000-gal. truck tank built of 10-gage Allegheny metal, with all seams butt welded and ground smooth on the inside. This tank is 47 in. high, 78¾ in. wide, and 14 ft. 6 in. long, with a 17-in. manhole and a 3-in. outlet welded in. The tank is insulated, then covered with 16-gage aluminum sheeting, with all seams welded, complete with run board and understructure. It is mounted on a 2½-ton, 6-wheel Mack truck.

Problems in Welding Aluminum Sheets

Welding the aluminum sheeting over the insulation is a difficult operation. Mostly oxy-acetylene welding is employed, but some electric-arc is used. On this particular job, there is no way that the aluminum sheeting can be backed up; therefore only experienced welders can undertake the work. Aluminum melts at a lower temperature than most metals, and it is very easily burned if care is not given to the work.

All welding of this aluminum sheeting is done by coating the welding wire with a flux; the tank is then welded with both lap and butt seams. The welds are then ground and polished off, making the seams perfectly smooth. Great care must be taken after the welding operation to neutralize the flux, which contains alkalies. If the alkali is not thoroughly removed, it will eat holes in the weld. This flux is neutralized with approximately a 10% solution of nitric acid; then the weld surface is rinsed off with clean, cold water and dried.

MILLER MEMORIAL MEDAL AWARDED TO JAMES W. OWENS

At the banquet held during the annual fall meeting of the American Welding Society in Chicago, September 22nd to 25th, a feature of the program was the formal presentation of the Miller Memorial Medal to J. W. Owens. Mr. Owens has devoted his entire time for the past twelve years for the development of welding and cutting. He has been a prominent member of the American Welding Society ever since it was organized and an active worker on many important committees. This organization started in the spring of 1918 when he became associated with the Welding Research Committee of the Emergency Fleet Corporation. During the fall of that year he was appointed arc-welding expert for the Bureau of Construction and Repair of the United States Navy and was stationed at Norfolk Navy Yard. Approximately $150,000 was subsequently expended on research work. In January, 1926, Mr. Owens severed his connection with the Navy and took the position of Director of Welding with the Newport News Shipbuilding & Dry Dock Company, from which position he recently resigned to become Director of Engineering with the Welding Engineering & Research Corp.

He was vice-president of the American Welding Society from 1920 to 1922 and is now director of the American Welding Society and is serving on a number of important committees. He is the author of a book, "Fundamentals of Welding," and of the paper on arc welding which was awarded first prize in the Lincoln Electric Co. essay competition. He is also the author of a number of excellent technical articles which have appeared in various engineering publications.

C. G. M. A. TO HOLD OCTOBER LUNCHEON MEETING

The executive board of the Compressed Gas Manufacturers Association has invited all association members and their friends to attend an October luncheon meeting to be held at the Hotel Astor at noon, Thursday, October 16th. Following the luncheon will be a meeting of the board, in which all members are invited to particpate.

Tractors Speed Up Pipe-Line Welding

Costs Are Reduced by Track-Type Machines, Which Are Used for a Wide Variety of Purposes and Conquer All Kinds of Terrain

By O. E. Andren

PERHAPS most men think of taking the work to the welding equipment rather than taking the equipment to the job.

There are many places, however, where the welding equipment is taken directly to the job, and one of the places that brings out the necessity for the maximum mobility of welding equipment is in the welding of pipe lines. Pipe lines are no respecters of good going, and almost universally the lines go straight across country, up hill and down dale, across gullies, streams, through swamps and through forests—and where the method of uniting the sections of pipe is through welding, then, of course, the welding equipment must follow the pipe.

That pipe-line welding is one of the big welding fields is clearly indicated by the fact that there is over 50,000 miles of pipe line in the United States to-day and approximately 11,000 miles of line under construction at the present time.

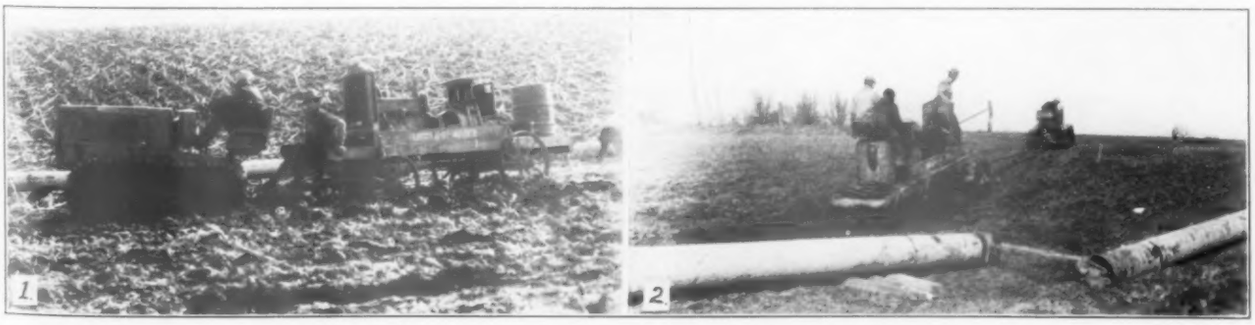
Both acetylene and electric welding are used on pipe lines. The acetylene method is used very generally, while, in the past year, electric welding has come into increased prominence due to recent developments for putting protective coatings on the welding electrodes, which, when properly handled, eliminate the possibility of brittle and porous welds.

Regardless of the method used, the equipment must be transported from location to location on the pipe-line job—and during every day the position of the welding units must be changed many times. Soft ground, grades, sand, and streams must be negotiated, and consequently a dependable method of hauling is of prime importance.

In the past, teams were used a great deal to transport the welding units, but it is universally conceded that the versatile track-type tractor is by far better fitted for the job. The track-type tractor, through its ability to make its own roadbed through the laying of its own track, can negotiate the severe grades, the soft ground, the rocky roads and the obstructions always encountered in this work, in a manner that is truly remarkable. Neither mud nor water seems to hold any terrors for a machine of this kind.

Indicative of the conditions met with in the welding of pipe lines, is the illustration of the 15-hp. "Caterpillar" tractor hauling a Lincoln arc welder unit through the muddy morass of a corn field. Without the sure-footed traction of this track-type tractor, obviously there would be many difficulties encountered in getting the equipment from place to place on time.

On the pipe-line job handled by W. B. Bibb of Griffin, Ga., track-type tractors are used exclusively to haul the welding units. A small "Caterpillar", Model Ten, is being used to haul the welding equipment for the tack welders. This



Views of "Caterpillar" 2-Ton Tractor Hauling the Welding Machine of the Welding Engineering Co. on the 1,200-Mile Pipe-Line Project From Cushing, Okla., to Chicago.

Illustrating a Few of the Many Uses for Track-Type Tractors in Welded-Pipe-Line Construction.

(Fig. 3 shows two model "30" wide-gage "Caterpillar" tractors, equipped with Cardwell side booms, making a sag. The "30" in the background is placed over the pipe in the trench, while the other "30" tractor is pulling up the pipe to the required angle of the bend. The model "10" tractor in the foreground is coming up with the welding unit on a sled, made of pieces of standard pipe welded together. Fig. 4 shows a tractor pulling a trailer loaded with welding equipment across a low, swampy place that has been corduroyed with logs. Figs. 5 and 6 are other views of tractors conveying welding equipment. These four views were taken on a pipe-line job being constructed by W. S. Bibb, of Griffin, Ga.)

tractor is followed by a large-size "Caterpillar" which takes care of the large acetylene-welding wagons which supply gas for making the roll welds. These wagons, containing an Oliver acetylene generator and implements, weigh from around 4,500 to 5,000 lb. and require considerable real power for handling over the corduroyed low places, the marshes and the hills. One tractor, however, is sufficient to handle and place four of these large welding units.

Another "Caterpillar" Ten tractor is used on that section of the pipe-line construction where the 200-ft. sections of pipe are welded together—or tied in over the trench. This machine handles five welding units which are contained on sleds made of pipe. In all, on the W. S. Bibb job, there are 9 tractors hauling welding equipment.

The need for fast and dependable power, capable of overcoming natural obstacles, is clearly seen, as on this job the welding unit followed the firing-line welders, who welded 16 sections of 5 joints each, totaling 3200 ft. of 10-in. pipe, in 1 hour and 20 minutes. On a previous job, the firing-line welders completed 60 miles of 6-in. pipe in 20 days with 16 welders.

While the saving of a man and team power is enormous by the use of tractors, the tractors themselves are especially advantageous, inasmuch as the smaller sizes are used, not only to handle the welding equipment on sleds or wagons but also to handle and transport the paint wagons and the supply wagons.

In addition, the same tractors are oftentimes used in emergency to do miscellaneous work, such as pulling trucks out of stalled places, and helping out when not immediately needed on their usual work.

WIRE ASSOCIATION FORMED

Announcement has been received concerning the organization of the Wire Association, with headquarters at 551 Fifth Ave., New York City. This is a non-profit organization of wire-mill executives, superintendents and foremen. It also includes plant engineers, traffic men, credit men, salesmen, and all others engaged in the wire industry, together with manufacturers and other interested people who have something to sell to the wire mill or some service to render for pay. Its specific purpose is to improve production methods and afford a clearing house for ideas on management problems, technical problems and research work in all phases of practical wire drawing and wire working. There will be special divisions for all the separate major interests in the wire industry together with divisions relating to drawing and fabricating wire and wire products. It is announced that one of the Committees which will be formed for research work will devote its activities to welding wire and rods. A monthly publication and an annual directory index will be published. The Chairman of the Organization Committee of the Wire Association is Richard E. Brown.

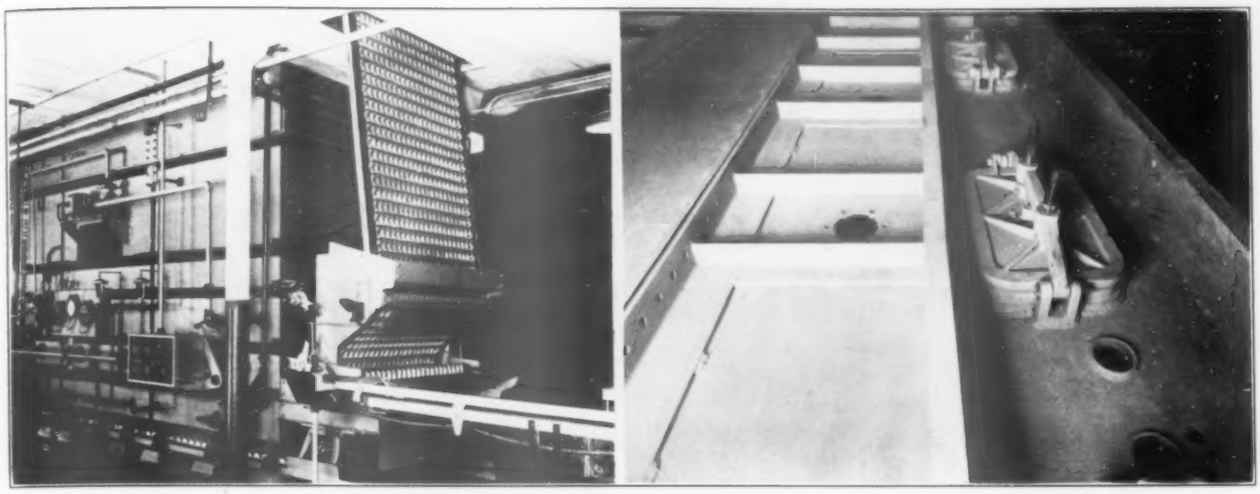


Fig. 1 (*Left*). Steel Plate, Angles, and Channels Are Used Principally in the Construction of This Pasteurizer.
Fig. 2 (*Right*). Stiffener Angles and Channels Are Welded Into Place, as Are Also the Cast Steel Doors.

Arc Welding Intricate Equipment

Welding Simplifies the Construction of Parts and Facilitates Their Erection to Form a Water-Tight Pasteurizer for Bottled Beverages

By J. R. Gruetter*

THE latest developments in the manufacture of an automatic machine for the pasteurization of bottled beverages includes an improved device for the mechanical handling of these bottles and improved construction by the use of the electric-arc-welding process. One of the most modern and probably the largest of these machines in existence was recently installed in the plant of Piel Bros., Inc., of Brooklyn, N. Y.

The Piel Bros. machine is 16 ft. 8 in. long, 6 ft. 2½ in. wide, and 16 ft. high. It has a pasteurizing capacity of 21 barrels of near beer per hour, or approximately 120 bottles per minute, and includes an endless chain, approximately 210 ft. long, of carriers to support the bottles on their way through the pasteurizing process. The bare pasteurizer, without the chain of carriers and without fixtures, weighs approximately 88,000 lb. When in operation—that is, including bottles, water, etc.—its weight is approximately 210,000 lb.

This pasteurizer, which is shown installed in Fig. 1, is fabricated principally of ¼-in. steel plate, 3½x2½x⅜-in. angles, and 10-in. channels. It consists of three tanks through which the bottles pass. Two of these tanks are 6 ft. 5 in. long and the third is 3 ft. 2½ in. long. All tanks are 6 ft. 2½ in. wide and 16 feet deep. The two larger tanks are divided on the inside, thus forming five separate channels through which the bottled beverages pass during pasteurization. Each tank is fabricated separately by fusing the steel members together with the electric arc, the three tanks being bolted together in assembling. This method of construction was necessary because the pasteurizer extends into the second story of the building in which it is installed. It also facilitated shipping.

The most outstanding mechanical development of this machine is the constant motion of the chain of carriers. Even while the bottles are being loaded and unloaded the chain is in motion. This is accomplished by introducing a Geneva movement into this pasteurizer. By use of this drive the chain is kept in motion, thus decreasing the power consumption, but the speed is decreased at regular intervals to allow time for the carriers to be loaded and to unload at the discharge end.

The principles of pasteurization employed are the same as those in other similar machines. The bottles go through a progressive warming system, which gradually attains the pasteurizing temperature, then decreases to a temperature approximately equal to that of the atmosphere. This progressive temperature is secured by overflowing the succeeding tanks into each other, thus obtaining a slightly higher temperature on the side of the tank through which the bottles pass on their upward travel. At the last tank the process

Fig. 3. Welder at Work on Top of a Tank. The Vertical Guide Bars Are Visible Below the Welder's Position.

*Vice President and General Manager, The Loew Manufacturing Co., Division of the Liquid Carbonic Corp., Cleveland, Ohio.

is reversed, and the bottles are cooled in preparation for labeling.

In the construction of this pasteurizer the electric-arc-welding process was used almost exclusively. No rivets were used, and only those fixtures which are necessarily removable were bolted. This type of construction made all joints absolutely watertight and permitted the strongest and most rigid possible construction. The tanks are fabricated of ¼-in. plate and are strengthened and stiffened by angles and channels arc welded into place, as shown in Fig. 2. It is estimated that there is a bulge pressure of 60,000

Fig. 4. The Welded Bottle Carriers Are Fabricated of Punched Steel.

lb. on the end sheets of the tanks when the pasteurizer is in operation. Even the cast-steel doors, which allow access to the floors of the tanks, are arc welded into place. In most cases the connections for instruments are also arc welded. The welding current for the fabrication of this pasteurizer was furnished by Lincoln "Stable Arc" welders.

The partitions between the tanks are made by arc welding together a piece of 3/16-in. steel plate and a piece of 10-gage sheet steel so that a space of about 2 in. remains between the two sheets. This space is filled with insulation.

Vertical guide bars serve to hold the bottles in place in the carriers as they pass on their journey through the tanks. These bars are 1½ in. wide and ⅜-in. thick, and are arc welded into place. There is approximately ½ in. between the bottom of the bottle and these guide bars. If one of the bottles should jar loose in the carrier, these bars, shown in Fig. 3, would prevent its falling to the floor of the tank.

The carriers which hold the bottles as they pass through the pasteurizer are fabricated of 9-gage steel joined by the electric arc. These carriers hold 20 bottles each and consist of 2 long pieces of punched steel arc welded to the steel divisions. The sides are punched from sheet steel, bent, then arc welded to the divisions by means of electric rivets. Some of these carriers are shown in Fig. 4.

The use of the electric-arc-welding process in the fabrication of this large pasteurizer has simplified its construction very much. The only possible alternative would have been riveted construction and would have necessitated much more preliminary work for its fabrication. There is also a possibility that the structure would not have been watertight. With arc welded steel construction these dangers are entirely eliminated.

BOILER MAKERS DISPLAY WELDING GASES ON FLOAT IN LABOR DAY PARADE

This year Atlanta, Ga., saw the largest Labor Day parade in the history of the city. It looked as though each industry tried to out-do all the others in the turn-out for the occasion. Those in the oxy-acetylene industry were particularly interested in the float of the boiler manufacturers in Atlanta. The photograph of this float was furnished through the courtesy of R. G. Wilson, district sales manager of the Atlanta office of the Burdette Oxygen Co.

On the float are displayed samples of work showing various types of boilers. In front of the truck, and just behind the cab, were a cylinder of oxygen and one of acetylene all hooked up ready for work, signifying the dependence these men place on the oxy-acetylene flame in their business. In the picture these cylinders are almost entirely obscured by the cab of the truck, and the top of the oxygen cylinder is cut off from view by a very charming Atlanta miss, who is sitting on top the cab.

Most of the men in the picture are employes of the Cofer & Bridwell Co., of 696 Marietta St., which is one of the

This Float of Atlanta Boiler Makers Gave Welding a Boost.

foremost concerns manufacturing boilers in the Atlanta district. They also fabricate and erect smokestacks and water towers. Their arc welders and oxy-acetylene outfits are in constant use, and they turn out some very commendable work.

WHO CALLS WELDING AN "INFANT INDUSTRY?"

The following excerpts are taken from the play "The Knights," by Aristophanes, written in the year 424 B. C.:

"Aye and I know the anvil whereupon his plan is forged;
'tis welded on the captives."
"Good! Good! Return him welding for his glue."
"And men from thence are hammering at it, too."

—Contributed by "El Soldando."

E. L. MILLS ELECTED PRESIDENT OF GAS PRODUCTS ASSOCIATION

During the semi-annual meeting of the Gas Products Association, which was held at the Congress Hotel, Chicago, in connection with the National Metal Congress, E. L. Mills, Sales Manager of the Bastian-Blessing Company, Chicago, was elected president, succeeding Mr. O. E. Engler of the Balbach Oxygen Company, Omaha, Nebraska.

Mr. Mills has been connected with the Bastian-Blessing Company sales organization since 1919. His contacts with numerous oxygen manufacturers who have served as distributing agencies for the Rego line of oxy-acetylene apparatus have made him intimately acquainted with the problems of marketing welding and cutting gases and equipment.

E. L. MILLS

He was a member of the original Board of Directors of the American Welding Society when that organization was formed, and since the formation of the Chicago Section of the American Welding Society has been an active worker with that group. He has also served almost continuously on one or more committees of the Gas Products Association, and through his efforts has secured a great deal of valuable cooperation from his organization toward the Gas Products Association's activities of all kinds. Mr. Mills has a wide reputation as an aggressive merchandiser and executive in addition to his acquaintance with the problems, possibilities and activities of the G. P. A.

A. J. Fausek of the Modern Engineering Company, St. Louis, Mo., was elected first vice-president, and W. H. Ballance of the Electrox Company, Peoria, Illinois, second vice-president. The Executive Committee consists of W. H. Ballance, M. L. Goodrich, Swift & Co., Chicago, and H. B. Pearson, Compressed Industrial Gases, Inc., Chicago. All of the officers and members of the Executive Committee are members of the Board of Directors, in addition to the following: O. E. Engler; L. F. Loutrel, Shawinigan Products Corporation; E. H. Smith, Commercial Gas Company, Minneapolis; Parker B. Francis, Kansas City Oxygen Gas Company, Kansas City, Mo.; E. J. Flood, Page Steel & Wire Company. C. T. Price was re-elected Secretary-Treasurer and Commissioner.

FIELD WELDING OF PIPE FACILITATED BY IMPROVED JOINTS*

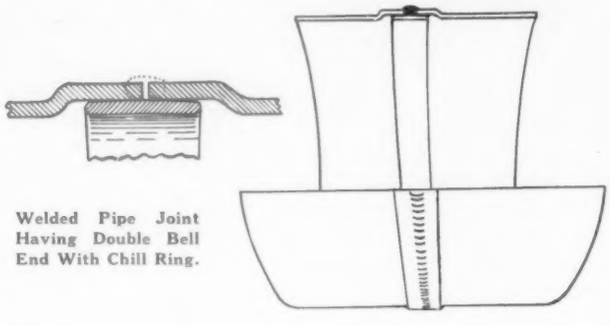
By William Graham†

Although the welding of large-diameter pipe lines has been carried on in the field for many years until recently, no effort had been made to supply a proper preparation of the ends of the joints for welding. Straight-end beveled pipe, such as was used for coupled lines, or the ordinary slip joint secured by a bell on one end in which the straight end of the next joint could be inserted, was all that the field afforded. Neither of these constituted a desirable welding condition, though many miles of these types of joint were welded.

In one case it was necessary to butt the ends of adjoining lengths together, with a proper spacing between them to provide room for contraction of the cooling weld metal. This resulted in a scarf or channel with no bottom, presenting a difficult problem to the welder, who had been told that 100% penetration was required, but no obstructions or "icicles" due to metal dropping through to the inside would be tolerated.

Plain ends offered no stabbing facilities, making the lineup and tack for welding a slow, expensive operation, since even with the help of specially constructed lineup collars the various joints had to be turned and tried to compensate for irregularities in size and roundness before they could be tacked. Even with the utmost care in this operation it was oftentimes impossible to secure a proper lineup, thereby presenting still further problems to the welders.

The slip joint eliminated some of the lineup and tack difficulties; and although it provided a chill for the welder to work against, eliminating the chance for "icicles", it had other objectionable features. The bell being of greater circumference than the straight end of the pipe, it expanded more than the straight end did when subjected to the welding heat, and consequently as the welder approached the completion of this weld he found the bell rising from the surface of the straight end in a so-called "ruffle". The weld



Welded Pipe Joint Having Double Bell End With Chill Ring.

in this type of joint was placed in shear, which of course reduced its efficiency against stress in tension.

A suggestion by A. O. Smith Corp. engineers that a chill or stabbing ring may be used in connection with straight end pipe was rejected because of the fear of turbulence set up in the gas flow and a possible restriction of capacity. Smith engineers then developed the Smith bell and spigot with dam as a means of providing field help. Since it required a great deal of time to design and build the special equipment required to produce the dam on the spigot end of the joint, a ring or collar of a special cross section was made up and circularly welded to one end of each joint. The other end was expanded to the proper diameter to slip over the stabbing ring end and a new field joint for welded pipe lines came into being. Both ends of each joint of pipe were sized in a press operation, resulting in fast, accurate lineup in

*From *The Oil and Gas Journal*, August 28, 1930. Reprinted by courtesy of the publishers.

†A. O. Smith Corp., Milwaukee, Wis.

the field with no necessity of turning and trying to make ends match. It left a uniform weld preparation constituting a groove or channel of constant width, provided a chill for the welder to work against, eliminated all trouble due to creeping or ruffling, and placed the weld in tension.

After the pipe mill was equipped to produce regularly this type of joint, the welding dam on the spigot end was formed by an upsetting operation while the end of the pipe was hot.

While this type of end preparation provided easy and economical lineup and a proper welding setup, it had two disadvantages: It proved to be an expensive operation in manufacture and resulted in a loss of approximately 3 in. of every joint, due to the upsetting of the dam and the stabbing together in the field.

In the search for a type of joint which would embody all the advantages of the Smith bell and spigot with dam but without either of its disadvantages, Smith engineers developed the double bell end with stabbing or chill ring, which has successfully met all requirements. Each end of the pipe is belled to a diameter large enough to admit a ring which serves the double purpose of supplying an aid to lineup operations and serving as a chill for welding. This ring is made up of a special rolled section of the same grade of steel as that in the pipe, having a raised bead in the center with beveled approach on each side, insuring a tight fit between it and the pipe. These beveled approaches take up any slight irregularity in the ends occasioned by rough handling and also make it possible to reduce the diameter of the ring at the edges, facilitating the stabbing operation.

This method of end preparation for stabbing and welding produces a joint having all the advantages sought for in the field without any loss of material. While the cost of belling the ends and of the chill ring must be added to pipe costs, it becomes insignificant in comparison with the savings effected through greater progress in the field. It is probable that the next step will eliminate the belled ends, since the field is beginning to believe that the restriction offered by a chill ring which projects into the inside of the pipe is negligible.

STEEL WORK OF NEW WILSON FACTORY IS ALL ARC WELDED

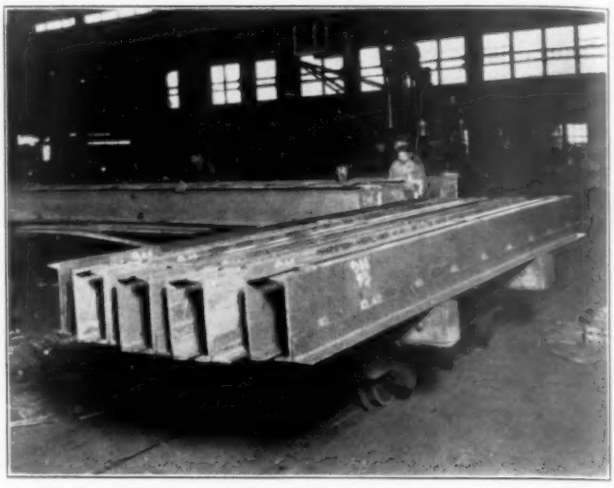
When the need of larger facilities made it necessary for the Wilson Welder & Metals Co., Inc., to build a new plant, they not only took the opportunity of building a scientifically laid-out factory, from the standpoint of production, but they also took the opportunity of erecting, for themselves, a structural-steel job in which electric welding was used exclusively.

As shown in the accompanying exterior view of the factory, the building is of steel and brick construction. All

View of New Wilson Plant.

welding was done in accordance with the American Welding Society specifications..

The columns and beams were fabricated by arc welding in the structural-steel shop and transported to the factory site, where the cross-beams were electric welded to the uprights. The picture taken in the structural steel shop

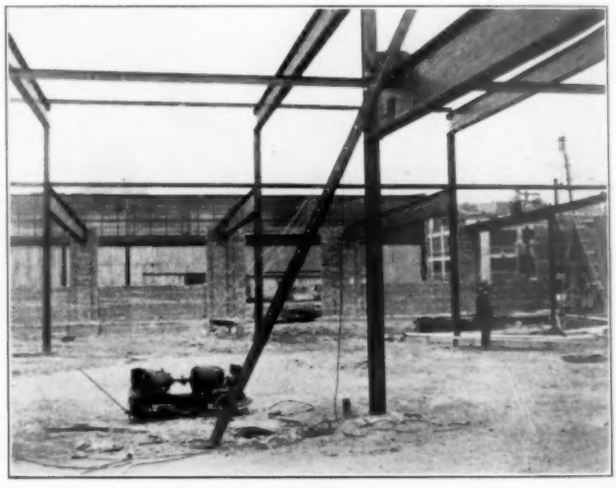


Fabricating Some of the Details in the Shop.

shows some of the beams being fabricated. In the foreground is a load of lintels for the door openings.

A view of the steel work in process of erection is also shown. The operator can be seen welding the I-beam to the upright just back of the ladder.

Electric welding effected a considerable saving in the tonnage of structural steel used and in the cost of both



Erecting the Steel Work.

fabricating and erecting, and resulted in much stronger and neater joints. The following data are of interest:

Tons of structural steel	74
Inches of $\frac{5}{16}$-in. fillet, shop welding	4,180
Inches of $\frac{5}{16}$-in. fillet, field welding	1,030
Total pounds welding wire	165
Pounds welding wire per ton of steel	2.23
Feet of fillet welds per ton steel	5.86
Percentage steel saved by welding	10

The kind of wire used was Wilson "Color-tipt" Grade No. 17, and the machine a 200-amp. Wilson Model "S" Type.

In addition to the structural work, the boiler, tanks, tracks and supporting hangers for the portable crane monorails were arc welded. This saved considerable in the weight of steel used and the cost of installation. All work benches, bins, and racks were also arc welded.

This new Wilson factory is located at 956-970 38th St., North Bergen, N. J. Included in the equipment is a complete up-to-date laboratory, which, together with the engineering department, is at the disposal of the industry. In addition, the company is operating a welding school where a complete course in arc welding is offered to employees of users of Wilson products.

Hints for the Welder

WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

WELDED CAR TIPPING RACK

The Manchester Iron Works, of Los Angeles, Calif., finding themselves in need of a contrivance for tipping autos to an angle for convenience in welding starter teeth in the fly wheels, and to do other work underneath cars, designed and proceeded to make an all-arc-welded rack for this purpose.

This tipping rack is very economically built, and, being home-made, is of quite simple construction. The runways for the wheels are of 8-in. channel iron, to which are welded the ½x4-in. cross members, which are of mild steel. The balancing pinions are placed about 10 in. off center, which furnishes almost a 45-deg. angle, as shown by the accompanying photograph. Anchor chains are, of course, used to prevent rolling or shifting of the car once in place on the rack. The car and rack can easily be tipped by two men. The rack is so built that the car may be driven onto it from either end.

Ivan M. Pinjuv is owner and manager of the plant where this rack is in use, and is the one who designed and built

Auto Repairs Are Facilitated by Using This Welded Tipping Rack.

this unusual and practical welded piece of auto-shop equipment. Mr. Pinjuv has been featuring the service of welding car-starter teeth.

A SHOP-MADE DEVICE FOR QUICK PREHEATING

A preheating table equipped with a gas burner to which a blast of air is furnished by means of a vacuum-cleaner motor, has given valuable service in the plant of the Manz Welding & Boiler Co., 1711 Maple Ave., Evanston, Ill. When a small casting or other part is to be preheated, it is laid over the gas nozzle on the preheating table and firebricks are built around it. Then the gas is turned on and the vacuum-cleaner motor is started. The burning gas and the air blast create a heat as intense as that of a blacksmith's forge, and in a few minutes the piece is brought up to a red heat. No time is wasted in kindling a fire, and when the burner is not in use no fuel is being consumed. Moreover, the device takes up very little space.

The gas used is ordinary city gas, and the valve is located in the supply pipe at a point convenient to the preheating table, so the operator can light the gas the instant the valve is turned on, and can adjust the valve while watching the blaze. The heat produced is great enough to melt steel.

The preheating table is raised a few inches above the floor of the shop. Gas is supplied to the motor through a

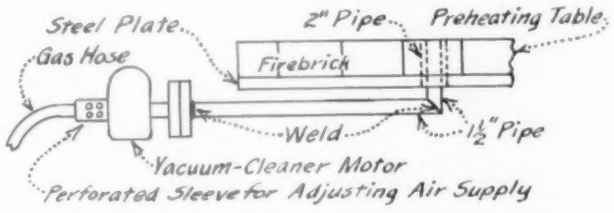


Diagram of Gas-Fed Forge-Like Blast for Preheating.

rubber hose, and the motor exhaust is connected to a 1½-in. pipe by means of a flange welded to the pipe. This pipe passes under the preheating table, and then by means of a welded right-angle turn it passes up through a 2-in. pipe set vertically in the table. All this equipment was made and assembled in the shop, and the motor was obtained from a discarded vacuum cleaner.

EXPENSIVE WELDING WIRE REDUCES COST OF WELDING

By changing from a welding wire that cost 5 cents a pound to a wire costing 15 cents a pound, a 21% reduction in welding cost has been made by one firm. The saving has come about through a large reduction in labor and overhead, as the 15-cent wire is a quick-flowing material compared with the cheaper product. The following table giving data on this case was furnished by E. W. P. Smith, manager of the Welding Engineering & Construction Co., 1810 Union Trust Bldg., Cleveland, Ohio:

	5c Wire (A)	15c Wire (B)	B/A Per Cent
Total feet welding	45	45	100
Pounds wire used	5	6¼	125
Set up time, hours	¾	¾	100
Arc speed, feet per hour (no set up)	20	36	180
Welding time, hours	2¼	1¼	55
Total time, hours (floor to floor)	3	2	66⅔
Welding speed, feet per hour (floor to floor)	15	22½	150
Labor @ $1.00 per hour	$3.00	$2.00	
Overhead, 100%	3.00	2.00	
Wire @ 5c and 15c per pound	.25	.95	
Cost	$6.25	$4.95	79

21% reduction in cost; 50% increase in capacity.

It will be noted that with a change to the high-speed wire, the amount of wire used was increased from 5 to 6¼ lb. It is a striking fact that while there is a 21% reduction in cost, it is accompanied with a 50% increase in capacity,

which, even if the cost remained the same, is highly desirable as it means more production for a given floor space.

This is an interesting illustration of the fact that first cost is not the final cost. In figuring the cost of a change in methods, in material, or in an investment, the immediate outlay is only one of several items of cost that are effected, and every item of cost must be considered to arrive at the final cost.

KINKS ON STRUCTURAL-STEEL WELDING

Some interesting side-lights on welded building construction were brought out by G. H. Danforth, of the Jones & Laughlin Corp., during the discussion at the third session of the annual meeting of the American Welding Society on April 24th, in New York City, as recorded in the July issue of the *Journal* of the Society.

His company, said Mr. Danforth, is now starting on what he recalled to be their tenth welded building, and experience had shown that the relative economy of welded and riveted construction hinged largely on the design and detailing. Welding, to be economical, requires an entirely different point of view in making the details, and the ideal welding details are not yet in existence. Welded joints are often designed on "paint-brush" methods, and often the fact is disregarded that every unnecessary inch of welding costs somebody 10 cents.

A welded building just being completed by his company was cited by Mr. Danforth as an example of accuracy in plumbing. The owner was very particular in this respect, but he was fully satisfied when he found the completed building, whose height was equivalent to 14 stories, to be within ⅛ in. of plumb from the ground to the top.

A problem encountered during the construction of this building was that of stiff bracing, which in the case of riveted construction merely requires the putting of a little draft in the holes, which allows the rods to be pulled up fairly tight. The problem was solved on this job by using a turnbuckle with a little flat welded on each end that could be clamped to the stiff member and pulled up. This method worked so well that it is planned to use it on future welded structures.

A case was also mentioned where a roof was to be built over a space between two existing buildings. Although in such cases the buildings are supposed to be parallel and the columns of the same height, they never are so. The use of welding simplified the problem considerably, as it enabled the design of a method of connection that had some come and go horizontally and vertically. In this case about 3 in. variation was provided each way, which proved to be more than ample.

It is on what a structural man calls "fussy work" that welding shows very decided economy, as the foregoing instance shows.

"Another little case where we used welding to advantage," said the speaker, "was on a one-story shop building with a flat roof. About the time we had it nearly finished—in fact, we were all through and the carpenter had put down his wood sheathing—the owner took it into his head that he wanted a sawtooth on that roof. Well, to try to build a sawtooth on top of an existing roof is a very mean job. With a little thought we concluded that welding was the way out. The owner marked out on the top of that roof the area he wanted to sawtooth. It was about 82 ft. long and 20 ft. wide. The carpenter cut through his sheathing on that thing with a saw. The roof was picked up to the position that was wanted for the sawtooth and the bracing welded in between. It cost probably one-half of what it would have cost to have done it by trying to punch and rivet.

"Another little thing that we did was not so much of a job structurally but interesting in a way. One of our country clubs near Pittsburgh concluded they wanted an automobile shed. The existing shed was a wooden structure, but the shed was not in accordance with the standard maintained at the club. There had been a concrete wall put in there to hold a fill and one of our friends conceived the idea that that wall would be a fine thing to build a shelter on, and we did it. That shelter is supported entirely from the wall. It comes up and curves and goes over 15 ft. away from that wall and the only bolts in that are the anchor bolts fastening the structure to the wall. By welding it there was no noise, the place was quiet, the club members were not disturbed."

WELDED LADLES FOR POURING BABBITT AND SOLDER

By A. Eyles

After reading the article "Babbitt Ladle Made by Welding", in the May, 1930, issue of *The Welding Engineer*, I am prompted to write a brief description of three improved types of all-welded ladles which I designed some few months

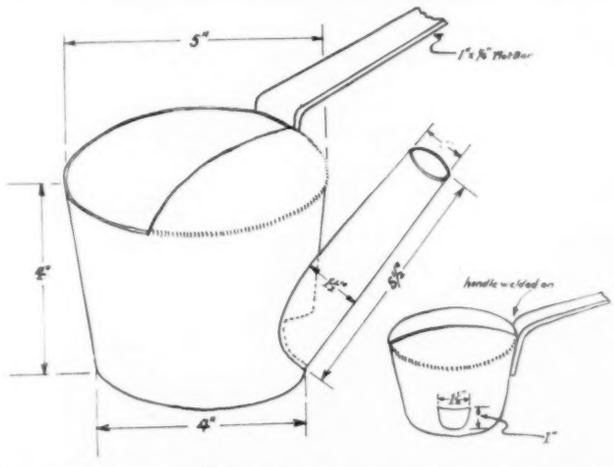


Fig. 1. This Shop-Made Babbitt Ladle Insures Clean Bearings Without Dross.

ago for pouring babbitt metal and also for pouring solder strips in multiple.

The ladle shown in Fig. 1 has the advantage of allowing the molten babbitt metal to be poured from the ladle bottom, thus ensuring bearing surfaces free from dross or slag. The body and spout of this ladle are fabricated from steel sheet 3/32 in. thick, and the parts are welded together with

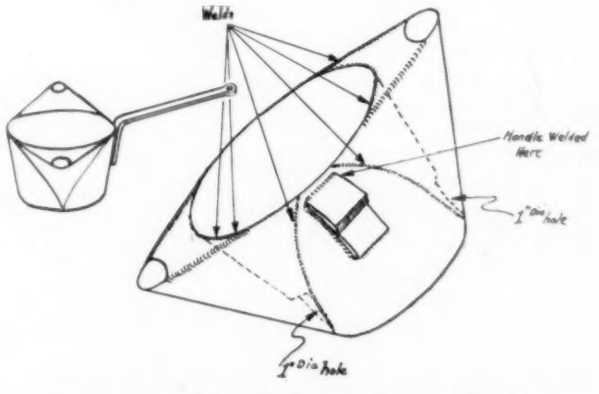


Fig. 2. Ladle With Two Tapered Spouts Welded On.

the oxy-acetylene flame. The handle is forged from 1x1¼-in. iron bar and strongly welded onto the body. The pouring hole in the ladle body is semicircular in shape, as the small sketch shows, for the reason that it is found

in practice that a semicircular hole of a suitable size gives far better results than a round hole. It keeps all impurities from entering the bearing and the ladle gives a clear flow of babbitt from the bottom.

Fig. 2 shows a ladle with two tapered spouts, which are found very useful. The ladle body and spouts are fabricated from mild-steel sheet 3/32 in. thick, the joints being oxy-acetylene welded. The top of each spout is formed of a piece of sheet steel cut to the desired shape and welded in place, leaving an opening of suitable size to allow the molten babbitt to flow steadily and in such a way as to avoid spattering and pocketing of air, which is important in babbitting bearings. This type of ladle can readily be made in various sizes to suit the class of bearings being babbitted. A useful size is 5 in. in diameter

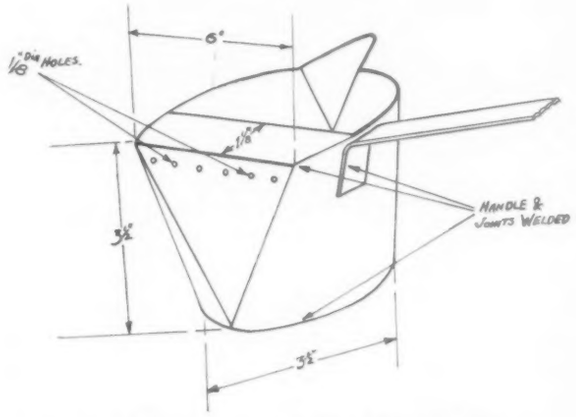


Fig. 3. Ladle for Pouring Multiple Strips of Solder

at the top and 4 in. at the bottom, and 4 in. deep. The handle is made from 1x¼-in. iron bar, about 20 in. long.

In Fig. 3 is shown a novel and useful ladle made by welding for making solder strips in quantity. The ladle body is made from steel sheet ⅛ in. thick, the joints being oxy-acetylene welded. In operation, the ladle is filled with molten solder to the height of the holes, and is tilted so the solder flows through the holes as the ladle is drawn over a suitable steel plate, leaving behind it six strips of solder about ⅝ in. in width. Six such solder strips each 12 ft. long, can be quickly poured with this ladle. The plate shown as welded across the top of the ladle prevents the molten solder from overflowing while pouring and helps keep back the dross or slag. Thus the ladle functions as a self-skimming type.

OPERATORS MAKE THE BEST GUESSES ON TIME WORK

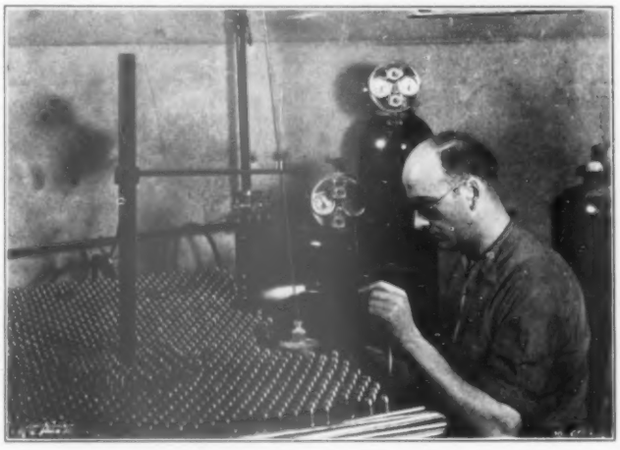
Part of the exhibit of the Bastian-Blessing Company, Chicago, at the National Metal Exposition held in the Stevens Hotel during the week of September 22nd, was a demonstration of an actual production job. The operation was the silver soldering of the rod brass swivel connection to a 5/16-in. O. D. 16 Stubbs gauge copper tubing. The equipment used was the Rego S. M. valveless torch economizer and Red Star regulator. This is one of the standard operations in making welding torches in the Bastian-Blessing plant, and the operator at the exhibit was being paid on a piece-work basis just as though he were working in the factory. The flame was adjusted when the work started in the morning, and the regulator adjusting screw was locked to prevent changing the regulation during the day. There were no valves on the torch, so the operator was entirely dependent upon the regulator to maintain the working pressure.

In connection with this demonstration a guessing contest was conducted. Visitors were invited to guess at the number of joints silver soldered during the day. The total number of visitors to the booth who made estimates was approximately 1500. The highest estimate was 2340 and the lowest was 95. These estimates were usually made after the visitor carefully timed the operations and observed the work over a period of several minutes. During some days the temperature was so high and working conditions so uncomfortable that the operator was forced to take rest periods which decreased the production rate on those days.

The wide range of estimates between the highest and the lowest is to be expected since there were certain to be some visitors who would not be at all skillful in estimating such operations. A study of the figures brings out a more interesting fact—that all of the most accurate estimates were made by welding operators, although there were a number of engineers and plant managers who studied the operation carefully and entered their estimates in the competition.

The winning estimates were as follows:

Monday	(7½ hours)	625
Tuesday	(10 hours)	920
Wednesday	(7½ hours)	686
Thursday	(7½ hours)	673
Friday	(10 hours)	950



Operator Engaged in Silver Soldering Work in the Production of Torches, in the Bastian-Blessing Booth at the Metal Exposition.

The prize winners for the most accurate estimates were as follows:

F. Teschner	Great Lakes, Ill.
R. W. Robinson, 5217 N. Damen St.	Chicago, Ill.
G. G. Crammer, Jr., 3345-69 W. Grand Ave	Chicago, Ill.
F. H. Thomas, University of Illinois	Urbana, Ill.
H. Bergman, 4211 W. Van Buren St	Chicago, Ill.

HIGHLY DUCTILE WELDS OBTAINED WITH NEW A. W. P. CRESTA ELECTRODE

Remarkable elongation of the weld metal has been obtained in tests made with the new Cresta electrode, recently announced as an addition to their line of electrodes by Alloy Welding Processes, Ltd., Ferry Lane Works, Forest Road, Walthamstow, London, E. 17, England.

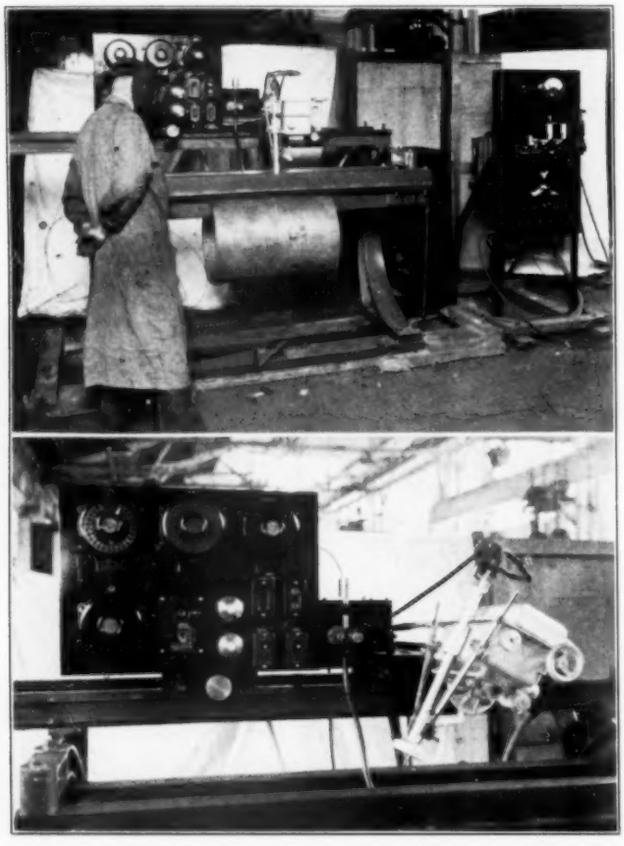
In 12 test pieces the elongation obtained between points 1 in. apart—that is, covering the weld metal—never fell below 33% and reached as high a figure as 36%. This elongation was gained with an entire absence of porosity. The tensile strength was 27 to 28 tons. The high strength and ductility of the weld make this electrode particularly adaptable for welding pressure vessels. Tests of this electrode are now being carried out by various firms, the manufacturer announces.

AUTOMATIC ATOMIC-HYDROGEN WELDER

A new automatic welder for atomic-hydrogen welding has been developed by the General Electric Co., Schenectady, N. Y. This is the first application of automatic equipment to this welding process, previous atomic-hydrogen welders being for hand welding only. The equipment was exhibited for the first time at the recent National Metal Exposition held in Chicago.

The new welder is designed for longitudinal seam welding of all kinds. It consists of a clamping mechanism for holding the work, an automatic travel carriage, a welding head and the usual control devices, and other accessories. The clamping mechanism and travel carriage are of standard types, while the welding head, control, etc. are of special design to suit the use of atomic-hydrogen welding. In addition there is an auxiliary device for feeding the filler rod into the arc, as the tungsten electrodes used to form the arc are consumed slowly and do not contribute metal to the weld.

In operation, the work is clamped in place in the usual manner, the travel carriage is set at one end of the seam, and the "start" push button is depressed. The remainder of the operation is automatic. With the pressing of the "start" button the line contactor closes, applying power to



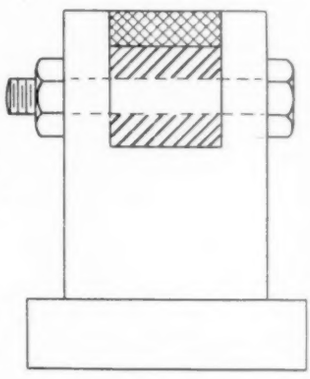
(Top) Atomic-Hydrogen Machine Automatically Welding Seam in Pipe. (Bottom) Welding Head Raised to Show Electrode Arrangement.

the equipment and simultaneously opening a valve supplying hydrogen to the arc. The striking of the arc, movement of the travel carriage, and length of the arc are all controlled automatically.

The atomic-hydrogen welding utilizes the passage of a stream of hydrogen through the arc between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms and these combine again a short distance beyond the arc into molecules of the gas. In so doing they liberate an enormous amount of heat, and thus more effective welding temperatures can be obtained than with the usual welding methods. In addition, since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal. Alloys containing chromium, aluminum, silicon, or manganese can thus be welded without fluxes and without surface oxidation.

MAL-ARC BACKING MATERIAL SPEEDS UP AUTOMATIC WELDING OF THIN SHEETS

The problem of arc welding automatically at high speeds sheet metal of 18 gage and less is said to be solved by the recent development of a new backing material known as Mal-Arc, which is being marketed by Elkon, Division of P. R. Mallory & Co., Indianapolis, Ind. Automatic-welding



Typical Mal-Arc Insert in Die Shank, in Which the Mal-Arc Strip Is Backed With Steel.

speeds of 30 in. per minute are made possible by the use of this new material. It is recommended that Mal-Arc not be used for the entire die. Very satisfactory results have been obtained by using a steel insert faced with a segment of Mal-Arc, usually about 3/16 to ¼ in. thick. The die shank is milled to provide a groove about ¾ to 1 in. wide by about 1 in. deep, into which the Mal-Arc insert is fitted, as the illustration shows. Dies now in use can be equipped with Mal-Arc inserts. A case is cited where an automobile manufacturer saved 75 cents per weld in welding the roof rail to the top by automatic arc welding backed with Mal-Arc, where previously he used gas welding and filled out the holes and uneven spots with solder.

MAGNO-MATIC EYE PROTECTOR

A device that flips protective lenses into and out of the line of vision so that the eyes are protected during the time the arc is burning and the vision is clear at other times, has been developed for the convenience and safety of arc welders and was displayed and demonstrated for the first time at the recent National Metal Exposition held in Chicago. This device is being marketed by the Magno-Matic Eye Protector Co., Peoples State Bank Bldg., Muskegon, Mich.

The protective lenses are controlled through a secondary circuit in which current is induced through an induction coil, the primary circuit of which is connected into the electrode circuit. As soon as the electrode makes contact with the work and before the arc is struck, the control circuit instantly energizes the magnets that flip the lenses into position. The instant the welding arc is broken, the activating current ceases to pass through the induction coil and the magnets of the eye protector release their hold upon the lenses and a spring flips these lenses out of the welder's line of vision.

The Magneto-Matic eye protector has a convenient plugging arrangement that enables the welder to disconnect the helmet from the line coil instantly without removing his helmet. The action of the magnets controlling the lenses is so quick that absolute protection is provided, and the

claim is made that this eye protector "beats the flame 'on' and follows the flame 'off'."

The makers of this device point out its safety features and also claim that the welder can do more work in a given time because both his hands are free to perform his work and the necessity is eliminated of repeatedly removing and

Automatic Shutter for Arc-Welding Helmets, Known as the "Magno-Matic" Eye Protector.

replacing his helmet or of tipping it back on his head in order to inspect his work. The manufacturers are offering trial helmets to those who want to try them out before purchasing.

NEW SEAM WELDER HAS MANY FEATURES

Many principles developed by the automotive industry are incorporated into the new No. 4 HDA seam welder designed by the Thomson-Gibb Electric Welding Co., Bay City, Mich. For example, although the driving welding roll is, of necessity, a slowly revolving member, the shaft and gears driving this roll are designed to revolve at a moderately high speed. The worm reduction unit is placed as close to the welding roll as possible.

Another important feature is the design of the perishable parts which is such as to facilitate replacement with the least possible loss of welding time. Another extremely important feature is that the driving mechanism is made up of independent units in order that these units may be suitably housed for lubrication purposes and, if occasion demands, easily removed to a work bench for repairing. Such repair work can often be better and more speedily handled on a work bench than on top of or inside of the machine.

All parts of the machine subjected to the welding heat are now more than adequately cooled, by independent circuits of circulating water.

The base is now one casting, the top casting being cast integral with the base, affording an enormously rugged foundation on which to mount the several units and to withstand the heavy stresses imposed.

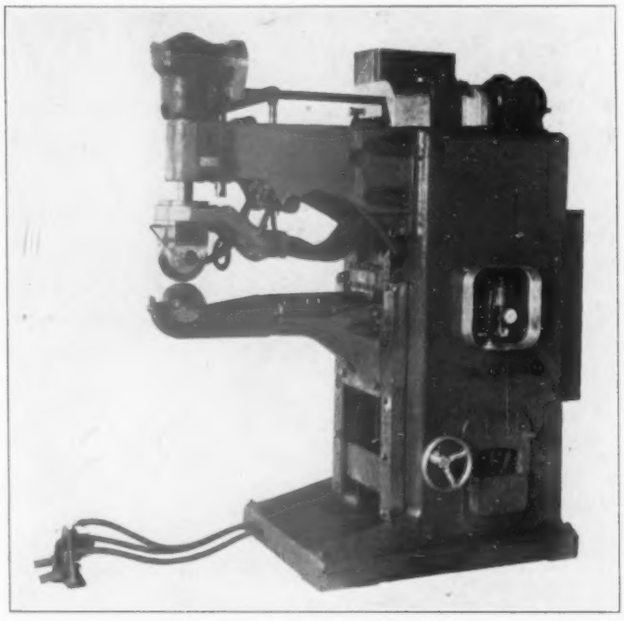
The driving mechanism consists of a motor, a 4-speed change gear box for changing welding speeds, a worm reduction unit, a driving-head unit, a 3-speed change gear box for changing interrupter speeds, and a patented current interrupter.

The motor drives the 4-speed gear box through spur gears. The motor pinion is non-metallic (Micarta), which eliminates noise. Protection is provided by a suitable cast aluminum guard.

The 4-welding-speed change gear box drives the worm reduction unit through spur gears, one being non-metallic. Spur gears are used to provide the most flexible drive possible to meet slower or faster drive-shaft speeds, which is made necessary by the use of smaller or larger welding rolls for special work, at the same time maintaining the actual welding speed.

The worm reduction unit in turn drives the upper welding wheel through a vertical shaft, mounted on ball bearings, and a set of bevel gears next to the upper welding wheel. The 3-speed change gear box for the interrupter speed is driven from the worm-gear-reduction shaft by means of a roller chain; this drive is arranged so that the welding speed can be changed without altering the number of current interruptions per inch of weld. However, the number of interruptions per inch of weld can be changed if desired by means of the 3-speed interrupter change gear box. The chain and the gears connecting the worm-gear reduction unit to the 4-speed gear box for the welding speeds are covered by a cast-aluminum guard. The 3-speed interrupter change gear box drives the interrupter through a set of two spur gears, one of which is non-metallic.

The 4-speed gear box, the 3-speed gear box, and the worm reduction unit are all totally enclosed and run in a



New Machine for Welding Seams.

bath of oil. They are equipped with Timken taper roller bearings, and all bearings are mounted to insure long life under heavy-duty and constant working conditions.

An extra upper welding roll and shaft assembly is furnished as standard with each machine in order that "lost welding time" will be only that of changing from the worn to the retrimmed assembly. A special lathe adapter, with a standard taper shank to fit the driving head of the lathe, is furnished with each machine to facilitate the redressing of the welding roll.

Either a straight or a circular seam lower arm can be placed in the lower-arm holder. The upper welding head will swivel into position, allowing the machine to seam either straight or circular seams, as desired.

The vertical stroke of the upper-welding-roll assembly is actuated by a double-acting air cylinder, mounted in the

upper-arm casting. An adjustable compression spring is attached to the operating lever between the air cyclinder and the upper-welding-head spindle. This spring is mounted on a ball thrust bearing to facilitate heavy spring adjustment.

The remote-control switch actuating the main contactor for controlling the welding current is attached to the compression-spring lever and is so designed that it will not operate until the spring compresses a sufficient amount to exert enough pressure on the work to prevent arcing as the rolls touch the metals to be welded. This switch is fully automatic in its action and, regardless of the stroke used or the wear of the welding rolls or their size, it needs no adjustment or attention.

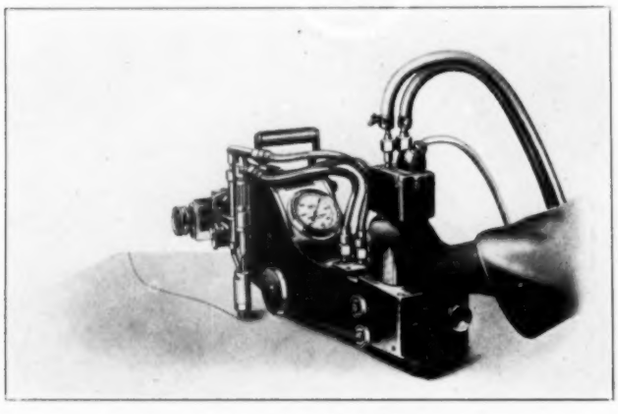
A foot-operated valve controls the air and can be moved to any position convenient to the operator. An automatic air-line lubricator and an air-pressure-regulating valve and gage are provided.

The transformer, heat regulator, and all electrical parts used on this type of equipment have been approved by the Underwriters' Laboratories.

The machine has a production capacity permitting it to seam into leak-proof seams two thicknesses of 14 gage at 6 ft. per minute. Lighter gages can be welded at greater speeds.

NEW PORTABLE MOTOR-DRIVEN CUTTING TORCH

Jos. C. Paulus & Co., of 2507-9-11 Potter St., Philadelphia, Pa., are importing a new small portable electric-operated oxy-acetylene cutting machine which is said to operate so well that little or no machine work is necessary. The motor is a

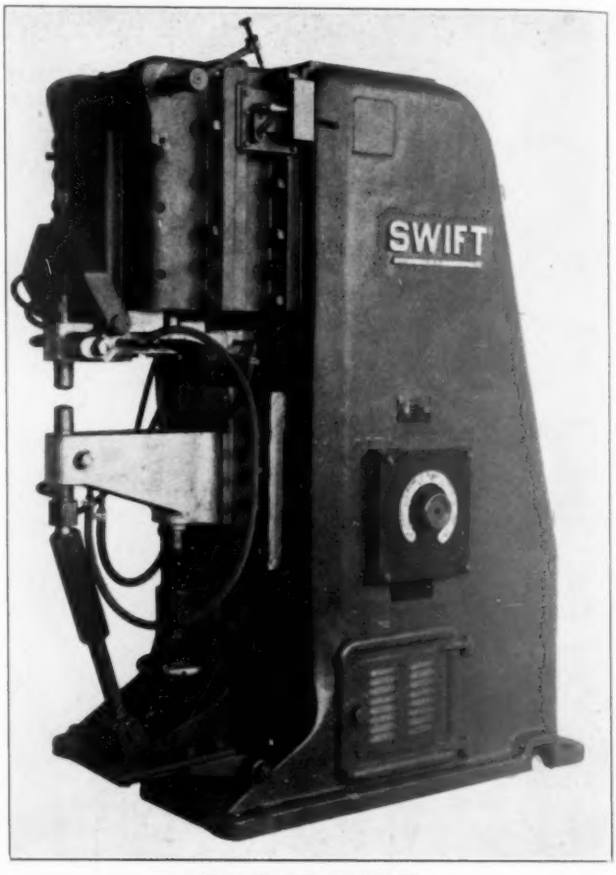


Compact Cutting Torch With Electric Drive.

built-in part of the machine and is of the universal type, which can be used for either direct or alternating current. This motor can be supplied for any current up to 220 volts. This machine comes equipped with a manometer for registering the velocity for the different thicknesses, which allows the operator to get an even travel, making a clean and even cut. The mixing chamber is placed back of the cutting nozzle to allow the gases to expand and unite before they are ignited. The cutting nozzles are made of two parts fastened separately into the cutting head, one inside the other, producing a round ring preheating flame with the cutting oxygen passing through the center of the flame. The preheating nozzle can be unscrewed for cleaning when necessary, while the cutting nozzle can be cleaned in place or removed as desired. This cutting equipment is part of a complete line of oxy-acetylene torches, which the Paulus company is importing for distribution in this country.

NEW HEAVY-DUTY SPOT WELDER

The illustration shows a new development in spot welders, it being a cam-operated automatic welder of the heavy-duty type and designated as No. 25 CVS (rated at 100 kva.) and No. 35 CVS (rated at 150 kva.). It is made by the Swift Electric Welder Co., 2567 West Grand Blvd., Detroit, Mich. The design and operation of this machine are



New "Swift" Spot Welder.

almost identical with that of the CV type of Swift projection welder, except that the welding heads are designed for spot welding instead of projection welding.

The amount of heat is regulated by means of a 6-point switch. The secondary coils, upper head, and table are water cooled, while the primary coils are bakelite treated and air cooled. The machine bed or frame is built of semi-steel. Operation is through a foot pedal and clutch, allowing one cycle or continuous operation.

LOTAN DEVELOPS TABLE FOR SOLDERING OPERATIONS IN PRODUCTION WORK

The Lotan Super Soldering Table was developed to increase production in the fabrication of neon electric signs, but the same patented principle can be applied to practically all production soldering operations.

The problems involved in the manufacture of neon signs make a very interesting study. The raised letters are made of strips of galvanized iron soldered together and in turn soldered upon a galvanized backing strip. This operation was a very tedious one, as it was impossible to use a torch flame on account of warping the galvanized strip. Consequently it had to be done with a soldering iron. The average time for soldering one of the double 18-in. letters was about 50 minutes. By using the Lotan soldering table it was possible to cut this time down to approximately 5 minutes.

The soldering operation with the table is very simple.

The raised letters are dipped in a shallow pan of Lotan paste solder, which picks up a sufficient amount of solder to do the operation. The letter is then placed in position on the galvanized backing strip. The clamp holding the letter is then locked in place and the operator steps upon the foot pedal, which raises the hot solder table into position against the galvanized backing strip. The heat from the table quickly fluxes the solder, which sweats the letters to the galvanized strip. The solder table is then lowered, and two chill plates operated by levers are swung into position under the galvanized strip, thus bringing about immediate cooling of the solder. The galvanized strip is then moved into position for the next letter.

ALL-METAL APARTMENT HOUSE PLANNED

The plans for the first all-metal apartment building, which is to be erected in Chicago, are outlined in detail in a reprint from the July issue of *The Architectural Record*, copies of which may be obtained from the American Institute of Steel Construction, which maintains offices in a number of the large cities. In the design of this building, the problem as outlined was to obtain the maximum usable floor area and number of floors compatable with livability, economy, and the building code. Various types and combinations of floor and wall constructions were considered; and the most economical was found to be insulated metal walls and battledeck floors. This construction is said to increase the net floor area, decrease the heat loss through the walls, and permit the addition of another floor, still keeping within the height limit of the zoning ordinance. The savings in heat and in construction costs permit the inclusion of such additional features as electric heat and other special equipment.

The battledeck floor, and the background of its development, is discussed in a reprint from the May issue of *Metalcraft* of an article entiled "Steel Evolves Most Remarkable Genius for Architecture Known in History," by Lee H. Miller. This reprint is also being distributed by the American Institute of Steel Construction.

NEW DIAMOND RUBBER CATALOG

A new catalog of belting, packing, hose, matting and miscellaneous items manufactured by The Diamond Rubber Co., Inc., of Akron, Ohio, for industrial use is just off the press. "Diamond" oxy-acetylene hose is offered with corrugated surface unless smooth surface is specified. It is of braided construction and comes in red, green or black color.

An interesting feature of the catalog is that the cover and mailing envelope were printed from rubber engravings, hand-cut from sheet rubber manufactured by the Diamond company.

Copies of the catalog pages have also been specially produced of correct size and shape for inclusion in loose leaf catalogs carried by distributors' salesmen.

LITERATURE ON REGO PRODUCTS

A number of folders and leaflets of such size that they can be used as envelope stuffers, have been issued by The Bastian-Blessing Co., 244 E. Ontario St., Chicago, Ill., describing their line of welding and cutting apparatus. One folder relates to the saving in gas and time made possible by the Rego economizer. Others pertain to the simplicity and ease of making welded pipe joints and connections for water and steam supply lines; the Rego Thomas torch and various welding outfits; the Red Star regulator; the GMK cutting attachment; and Basic flux for welding cast and malleable iron, steel, cast aluminum, brass and copper and alloys.

MANUAL ON GAS AND ARC WELDING

The theory and technique of gas welding and also of welding by both the metallic and carbon arcs are explained in a 32-page booklet issued by the American Steel & Wire Co., of Chicago and New York. Preparation of the work to be welded, selection of electrodes, proper arc length and welding current, penetration, impurities, manipulation of the welding torch, and uniformity are among the topics discussed. The various grades of Premier welding wires are described as to chemical composition, applications, and diameters and corresponding current values in the case of electrodes. In each case curves give the speed of welding for any thickness of material. The A. W. S. specifications for electrodes and gas-welding rods are also quoted.

NEW G-E ELECTRODE BOOKLET

Applications of various types of G-E electrodes for hand or automatic welding are described in a booklet, known as GEC-93, published by the General Electric Co., Schenectady, N. Y. A table listing many different applications enables the user of welding to select quickly the particular electrode that best suits his needs. Eight different electrodes are listed in this table. Tables also give the chemical contents of the various electrodes and suggested current values and voltages for hand and automatic welding and for different diameters. A section is devoted to G-E welding equipment and accessories.

SOLDERING AND OPEN-FLAME TORCHES

A folder on Schmidt soldering and open-flame torches, for operation on gasoline or gas (artificial or natural) without generating, has been published by the Minn-Kota Manufacturing Co., Fargo, N. D. Various models of these torches are shown and described, together with a mixing valve, different types of baffleheads, and various sizes and styles of soldering coppers. Particular emphasis is placed on the saving in time and fuel resulting from the non-generating feature. It is explained that the flame lights instantly and burns on the inside, with reflected heat baffled back, and any size of copper gets red hot in four minutes or less.

BOOKLET ON WELDITE GREEN SURFACED RODS

The Fusion Welding Corp. recently published a circular describing its Weldite Green Surfaced electrodes for metallic arc welding of mild steel. This bulletin describes in detail the effect of "Green Surfacing" on the welding arc, the deposit metal, and operating characteristics of the electrode, also the action of Green Surfacing as it is vaporized in the arc. It is also pointed out that the cost of using welding rods is four times the cost of the rods themselves, since an operator is able to deposit metal during only 40% to 60% of the time for which he is paid. Other facts for those using welding are included in this circular, which may be had upon request to the Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago, Ill.

BULLETINS ON UNA WELDING UNITS

A number of bulletins recently published by the Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, Ohio, describe the arc welders and the new semi-automatic welding unit manufactured by this company. The welders are of single- and double-operator types for a. c. and d. c. operation.

The particular feature of the semi-automatic welding head is the use of light-weight fans operated through an

air nozzle. These driving fans are said to contain so little inertia that they allow practically instantaneous changes in speed, even to reversal, or backing-up, of the electrode. The oscillating air nozzle is said to give an extremely sensitive and accurate control of the arc length. Other bulletins relate to tensile tests and ductility of welds made with Una rods.

These bulletins are arranged in a binder, the front cover of which has near the bottom an embossed strip, 7 in. long, which is a striking representation of a bead of weld metal.

FOLDER ON GASOLINE CUTTING TORCH

A new torch for cutting with "regular" automobile gasoline, obtainable at any service station, is made the subject of a folder published by the Torchweld Equipment Co., 224 N. Carpenter St., Chicago, Ill. The features of this torch are enumerated and its economy in cost pointed out. Particular emphasis is placed on its safety. This torch, which was described in the September issue of *The Welding Engineer*, is said to use only 2 gallons of gasoline in 8 hours of cutting.

SPECIFICATIONS FOR IRON PLATES

The A. S. T. M. tentative standard specifications A 129-30T for open-hearth iron plates of flange quality are published in a recent number of the Armco Engineering Bulletin, issued by The American Rolling Mill Co., Middletown, Ohio. These specifications cover chemical and physical properties and tests, permissible variations in weight and thickness, finish, marking, inspection, and rejection.

SEVERELY TESTED WELDS DISPLAYED AT EXHIBIT

One of the exhibits in the welding section of the National Metal Exposition, which was held at the Stevens Hotel, September 22nd to 26th, was that of the Struthers-Wells Co., Warren, Pa. One prominent part of this exhibit was a display of a large collection of test pieces. These test pieces were welded samples in different metals and of different thicknesses, which had been tested both for tensile strength and ductility. It was a striking demonstration of the care which is being used in some plants to keep welding quality under scientific control by means of systematic testing procedure. Another feature of the weld was a small tank made of class-B welding steel plate, ¾ in. thick, with flanged and dished heads. The vessel was 20 in. in outside diameter and 18 in. long in straight shell. The plates tested to 58,400 lb. tensile strength, 36,400 lb. yield point, and showed 30% elongation. During the test, the original spherical dished head changed to an ellipsoid form with an axis ratio of 1-to-2. The shell stretched 6 in. in mid-section. The theoretical bursting pressure of the shell was figured to be 4,733 lb. per sq. in. The applied pressure materially exceeded this figure without a sign of any failure in the weld or plate. The vessel had in fact been stretched far beyond the elastic limit and permanently distorted with no sign of failure in the weld.

WILL A WELDED TANK WIN THIS COMPETITION?

The Chicago Bridge & Iron Works, manufacturers of steel tanks and steel plate work, is sponsoring a competition for improved design in elevated steel tanks. Four thousand dollars in prizes are being offered for the best eight renderings, divided as follows: First prize, $2,000; second prize, $1,000; third price, $500; and 5 honorable mention prizes of $100 each.

Each entry in the competition will consist of two drawings of a typical elevated steel tank with a nominal capacity of 200,000 gal., a height to top of approximately 110 ft., a height to bottom of not less than 85 ft., and a riser not less than 5 ft. in diameter. One drawing will include a direct elevation and two horizontal sections or plans to a ¼-in. scale. The other will be a perspective drawing to the same scale.

The entries will be received anonymously, displayed in a suitable room in an impartial manner, and judged by a jury of award consisting of Howard Cheney, president of the Chicago Chapter of the American Institute of Architects; R. W. Zimmerman, architect, of Chicago; and George T. Horton, president of the Chicago Bridge & Iron Works. Albert M. Saxe, 430 N. Michigan Ave., Chicago, has been appointed professional advisor for the competition and will handle all communications regarding it. A brochure giving complete details of the competition may be secured by addressing Mr. Saxe.

This competition is open to architects, engineers, and draftsmen all over the world. Applications for entry will be received by the professional advisor, Albert M. Saxe, until December 1, 1930. The contest closes on March 1, 1931.

C. A. McCUNE TO DIRECT RESEARCH ACTIVITIES OF NEW ORGANIZATION

It is announced that C. A. McCune has been elected a member of the Board of Directors and Director of Research of the recently organized Welding Engineering & Research Corp., of New York. The company, as the name implies, will be devoted to industrial and scientific welding research and engineering, the services of its members being available for consulting on all problems relating to welding by all known processes and to all metals, also the application of welding in all fabricated metal fields, such as structural steel, tanks and boilers, aircraft, automobiles, marine, railway, etc.

Preparations are being made for equipping a thoroughly modern laboratory, the equipment to include the newly developed isothermal method of determining variations in wall thicknesses of steel bodies, the magnetic method of steel analysis, and the X-ray method of analysis.

This company will devote much time to certifying the qualifications of welders as to fitness for special work. It will also inspect finished welded construction and pass on the suitability of drawings and designs of welded constructions.

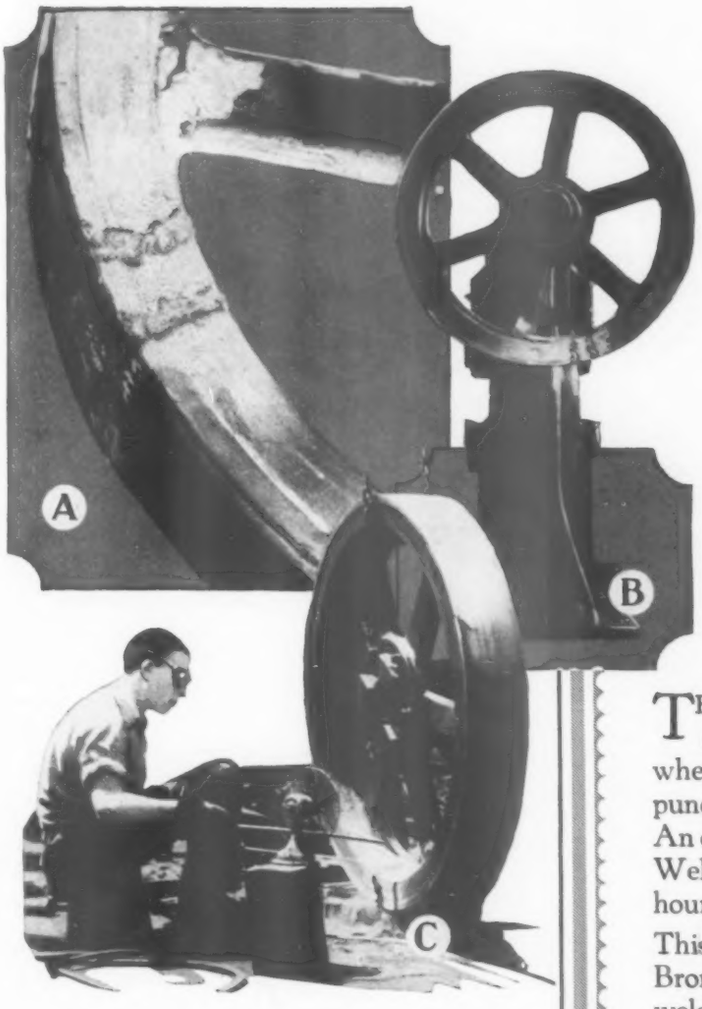
Others in the field of science who will be active in the organization include:

Professor C. A. Adams, President, is Lawrence Professor of Engineering, Harvard University, and consulting engineer of note; recipient of the Miller Medal and Fellow of the American Academy of Arts and Sciences; past president and honorary member of the American Welding Society.

J. H. Deppler, Vice President, is chief engineer and works manager of the Metal & Thermit Corp., and is especially noted for his developments in the application of thermit welding to large steel bodies. He is a past president of the American Welding Society.

J. W. Owens, Director of Engineering, in 1928 was awarded the Lincoln prize of $10,000 for the most outstanding contribution in arc welding in the world and recently was awarded the Miller Memorial Medal. He was formerly director of welding for the Newport News Shipbuilding Co.

Leon S. Moisseiff, Director and member of the Technical Board, is one of the most outstanding bridge engineers of the world, having engineered such projects as the Manhattan bridge and the Queensboro bridge over the East River.



A: Close-up view of flywheel after repair-welding with Tobin Bronze.

B: The bronze-welded flywheel restored to service on the punch press and strong as before the fracture occurred.

C: Welder repairing broken flywheel by the oxy-acetylene method with Tobin Bronze.

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There is a suitable Anaconda Filler Rod for every bronze-welding purpose. Principal Anaconda Welding Rods, with their melting points, are listed below:

for oxy-acetylene welding

Tobin Bronze*	1625°F
Manganese Bronze	1598°F
Brazing Metal	1634°F
Naval Bronze	1625°F
Electrolytic Copper	1981°F
Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

for arc welding

Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

*Reg. U. S. Pat. Off.

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REPAIR—WELDS 2,800 lb. FLYWHEEL *in* 6 *hours*

THE value of Tobin Bronze Welding in an emergency was strikingly demonstrated when this 2800 pound flywheel came off a punch press, and cracked on a concrete floor. An experienced welder, using Tobin Bronze Welding Rods, had it back in service in six hours.

This is typical of the manner in which Tobin Bronze saves time and money in repair-welding broken castings. The low welding temperature required usually eliminates pre-heating and minimizes the risk of distortion. And a properly made Tobin Bronze weld is stronger than the casting itself.

The uniform composition and high quality of Anaconda Copper Alloy Welding Rods are due to the experience and technical knowledge of The American Brass Company in developing alloys suitable for all bronze-welding purposes. The manufacture of Anaconda Welding Rods, from raw materials to finished product, is attended with the most scrupulous care. Publication B-13, containing full information, will be mailed on request.

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ANACONDA
WELDING RODS

New York. He is the chief consulting engineer for the Port of New York Authority.

A. V. deForest, Director and member of the Technical Board, was awarded the Dudley Gold Medal by the A. S. T. M. in 1928 for his work in the application of magnetic analysis of steel. He is a consulting engineer of prominence in the field of metals.

Mr. McCune, besides his wide interest in industrial research, was one of the early technical pioneers of welding. In 1905 as assistant engineer and later as chief engineer of the Commercial Acetylene Co., he successfully assisted in the development of the cylinders used in the present day for the safe storage of acetylene. He has contributed many devices used in both the manufacture of acetylene and its application to lighting and welding.

His inventions made possible the lighting of railway passenger cars by the acetylene mantle system. In 1916 he joined the Page Steel & Wire Co., actively continuing his early investigations of welding wire, and, as a member of the Emergency Fleet Welding Committee, was chiefly responsible for the development of specifications for welding wire.

He is one of the founders of the American Welding Society and since 1919 has served as chairman of the Welding Wire Specifications Committee of the American Bureau of Welding. He was elected to the office of president of this society in 1922, and is at present its treasurer, having held that office since 1923. He is also a member of the Miller Memorial Award Board. He now holds the office of president of the International Acetylene Association, and for two years served as chairman of the Morehead Medal Award Board and chairman of the Acetylene Development Committee. He is a member of the National Research Council, Advisory Board of the United States Bureau of Standards, American Society of Mechanical Engineers, British Institute of Metals, American Society for Testing Materials, United States Chamber of Commerce, and chairman of the welding committee, Chicago World's Fair Exposition, 1933. He is active in technical-committee work, having made a number of contributions, particularly on the properties and metallurgy of welding wire, as well as assisting in the preparation of textbooks on welding.

Mr. McCune relinquishes the office of Director of Research of the American Chain Co. after having been with this company's associated interests over fourteen years.

NEWS OF THE INDUSTRY

L. M. Hogan, formerly with the Brooklyn, N. Y., division of Steel & Tubes, Inc., has been transferred to the main office of the company at Cleveland, Ohio, where he will be in charge of sales promotion and orders.

The first meeting of the 1930-31 sessions of the Los Angeles (Calif.) Section of the American Welding Society, was held on Thursday evening, Sept. 18th. An interesting talk was made by James W. Foley, widely known humorist and poet, followed by a talk by Robert G. Wulf, chemical engineer, connected with the Kobe Corporation, on "The Chemistry of Oxy-Acetylene Welding and Cutting." A portion of the program was devoted to questions and answers and discussions pertaining to events and problems in the field of welding. W. A. F. Millinger is chairman of the Los Angeles section of the society.

The Gregg Steel Products Co., of Compton, Calif., rerecently opened its plant on Alameda Blvd., and will specialize in the manufacture of welded steel windows. They are installing a new Federal automatic butt welder, and expect to be on a production basis with their products by November 1st. Albert Lang is general foreman of the plant.

The city of Los Angeles, Calif., is constructing a viaduct across the Los Angeles river and the tracks of the A. T. & S. F. and the U. P. railways on East Fourth St., to be of reinforced concrete. Arc-welded framework of extra-heavy reinforcement steel for this job is being fabricated by the Soule Steel Co., of Los Angeles. This is said to be one of the heaviest welded-steel reinforcement jobs ever attempted in California.

For the convenience of their customers in the Detroit territory, Elkonite, Inc., has resumed sales activities from the company's office in the Fisher Building. The display room alone will be maintained at 1050 Mt. Elliott Ave., while access to the various types of welders, etc., may be had by applying to 1122 Fisher Building.

The St. John X-Ray Service Corp., 505 Fifth Ave., New York City, announces that it has arranged with the Westinghouse X-Ray Co., Inc., to sell Westinghouse equipment in the industrial fields.

A Prout, formerly with the Signal Iron Works, in Signal Hill, Calif., is opening a welding and machine shop at 5795 Cherry Ave. The new shop will be known as The Four Point Service Welding & Machine Shop. General oil-field welding—both acetylene and electric—and machine work of all kinds will be featured, together with the sale and rental of used field supplies.

Chas. E. DeLong, formerly with the Fusion Welding Corp., of Los Angeles, Calif., has joined the Air Reduction Corp. as a member of the engineering division, and will work out of the Los Angeles office. Mr. DeLong has been connected with the welding business for over 12 years. He is originally from Watsonville, Calif., where he was in the welding business for a number of years.

The Isley Iron Works, of Los Angeles, Calif., recently established in their plant at 631 West Florence Ave. a department for student welders. They are offering a course of practical instruction in electric-arc and acetylene welding and structural-steel work, for any interested in this work. The practice work and instruction, being carried on in the plant of Mr. Isley, affords demonstrations of a practical nature.

A news item in the August issue of *The Welding Engineer* regarding the transfer of ownership of the Clark Welding Works, of Pasadena, Calif., said that Mr. Clark was the retiring manager. This should have been J. P. Mitchell, the error occurring by reason of the name of the shop being the Clark Welding Works.

John J. Cone, president of Robert W. Hunt Co., engineers, and a member of that company since its organization in 1888, has retired. C. B. Nolte, vice-president and general manager, has been elected president and general manager of the company, with headquarters at the general offices in Chicago. J. C. Ogden, a director and eastern manager of the company, has been elected vice-president, with headquarters at New York City.

The new address of the Harris Sales Co., of Philadelphia, Pa., is 1801 South 68th St., where the company maintains office, storage, and repair facilities all under one roof. The former address was 1139 South 58th St.

The Reliable Welding Co., 1634 S. Long Beach Ave., Los Angeles, Calif., opened for business recently under the partnership of Rudy Ostronik and L. Tuttle. These men were

both formerly associated with the J. B. Eastman Welding Works, who recently sold their business to another concern. The new shop is fully equipped for all kinds of general commercial welding, including both gas and electric work.

The Western Welding Supply Co., of Los Angeles, Calif., has moved from 4804 Everett Place to 4517 East 50th St., which is situated in the Central Manufacturing District of the city. This company features Westco welding rods and general welding supplies, and are distributors in this district of the U.S.L. electric welders. H. S. Hanna is manager.

The Western Pipe & Steel Co., of Los Angeles, Calif., is commencing work on the erection of two high-pressure gas holders for the Southern Counties' Gas Co. These large tanks are to be 103 ft. high and 50 ft. in diamater and will be of both riveted and welded construction. The rivet heads will be caulk welded for gas tightness. This company is also erecting several of these holders at different points in southern California.

The results of the recent election of officers of the American Society of Mechanical Engineers for 1931, have been announced as follows: President—Roy V. Wright, Railway Age, New York, N. Y. Vice-presidents—William A. Hanley, Eli Lilly Co., Indianapolis, Ind.; Thomas R. Weymouth, Oklahoma Natural Gas Corp., Tulsa, Okla.; and Harvey N. Davis, Stevens Institute of Technology, Hoboken, N. J. Managers—W. L. Batt, S.K.F. Industries, Inc., New York, N. Y.; H. L. Doolittle, Southern California Edison Co., Los Angeles, Calif.; and H. L. Whittemore, Bureau of Standards, Washington, D. C. Representatives to American Engineering Council—W. R. Webster, R. V. Wright, J. W. Roe, Robert Yarnall, E. N. Trump, B. E. Hull, E. O. Eastwood, W. Trinks, Warner Seely, and William S. Conant.

Howard J. Burnish has established an office at 2976 S. Superior St., Milwaukee, Wis., where he will engage in consultation work with firms and individuals interested in the establishment of welding departments or who are confronted with problems pertaining to the use of welding. Mr. Burnish was formerly with the A. O. Smith Corp. and the Worthington Pump & Machinery Corp.

Joseph T. Ryerson & Son, of Chicago, Ill., are representing the Warner Engineering Corp., of Pomona, Calif., in the sale of a new brazing torch being manufactured by the Warner company and announced to the trade in the September issue of *The Welding Engineer*. This torch created a great deal of interest when demonstrated at the recent National Metal Exposition held in Chicago.

The Hollup Corporation, of Chicago, announces that W. E. Van Dreser, formerly Minnesota and Wisconsin representative, has been elected vice-president in charge of the entire Eastern district with headquarters at the company's plant at 269 37th St., Brooklyn, N. Y. C. L. Jones, formerly manager of the Brooklyn plant, has been placed in charge of the Southeastern district of the company, with headquarters at Atlanta, Ga.

The meeting of the Australian Welding Institute held at the Working Men's College in Melbourne, September 25th, was devoted to a discussion of the proposals of the Technical Committee of the Institute respecting the issuing of certificates of competency to welding operators, and to problems regarding welding procedure and stresses in welds.

The Republic Steel Corp. has received an order for 110 miles of electric-welded steel pipe for shipment to large natural-gas interests in the Southwest. The company now has all three units of its electric welding pipe plant at Youngstown, Ohio, at capacity operations, the last unit being started a few weeks ago. Unfilled orders on hand are sufficient to maintain a high rate of activity for the plant through the late fall, according to company officials.

Classified Ads

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Count 8 words to line. Add 6 words for keyed address.

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Electric Welder, with 11 years' experience, desires permanent connection. Prefers to line up with firm who keeps only one welder to take full charge of welding. Address Box 466, Matamoras, Pa.

Acetylene Welder, with 11 years' experience in all classes of work, desires permanent position; one with chance of advancement preferred. Address W. F. Hafley, Madison, Ind.

Combination Welder, with 4 years' experience in arc and some acetylene, including 1 year on pressure work, wants steady position. Age, 26; married. Will go anywhere. Address Box 283, The Welding Engineer.

First-Class Electric Welder, also with acetylene experience, desires position anywhere in U. S., but preferably in the East. Ten years' experience in ornamental iron work and structural steel. Address Box 284, The Welding Engineer.

Acetylene and Arc Welder, with 10 years' experience on job-shop, pipe, sheet-metal, boiler, structural, and auto welding, desires permanent position anywhere in U. S., but prefers Chicago or vicinity. Address Box 282, The Welding Engineer.

Electric Welder, with 7 years' experience, desires position. Has worked in railroad shops, refineries, and contract shops, and was in charge of welders on a Texas pipe-line job. Also able gas welder. Address Box 285, The Welding Engineer.

FOR SALE

Welding Shop in Chicago, same location 11 years, doing $150 to $175 a week. List of dependable representative customers. $3,000. Owner. Address Box 280, The Welding Engineer.

Rebuilt U.S.L. Arc Welder, 200-ampere, stationary type, $275.00. Address Box 286, The Welding Engineer.

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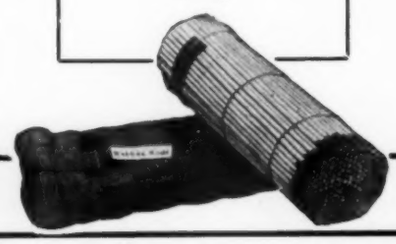

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